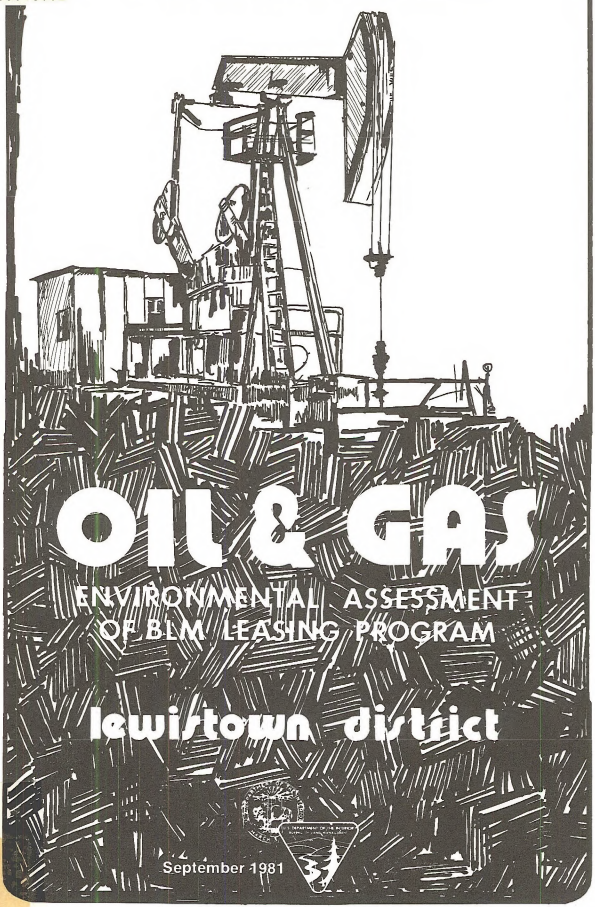

OIL & GAS

ENVIRONMENTAL ASSESSMENT OF BLM LEASING PROGRAM

lewistown district

September 1981

OIL & GAS

ENVIRONMENTAL ASSESSMENT OF BLM LEASING PROGRAM

BUREAU OF LAND MANAGEMENT

lewistown district

September 1981

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PROPOSED ACTION

Introduction

Chapter 1, Proposed Action, of this assessment pertains to oil and gas activities in the states of Montana, North Dakota and South Dakota. It provides an overview of oil and gas operations and of the general oil and gas situation in this three state area. The remainder of this assessment, Chapters 2—5, focuses upon specific environmental considerations concerning oil and gas activities within the Lewistown District.

Purpose and Need

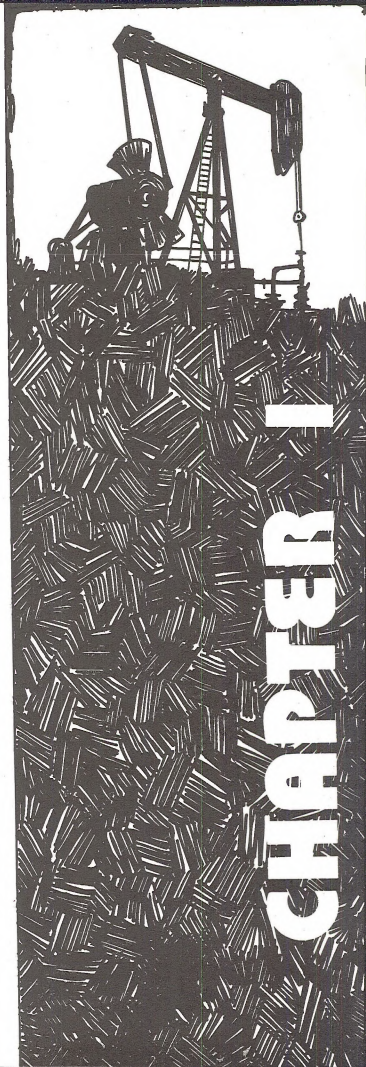
This Oil and Gas Environmental Assessment has been prepared pursuant to Section 102(2)(c) of the National Environmental Policy Act of 1969, as amended. It is designed to assess the impacts from Federal oil and gas leasing by the Montana State Office of the Bureau of Land Management (BLM), United States Department of the Interior, in the states of Montana, North Dakota and South Dakota.

The Proposed Action is the continuation of BLM's oil and gas leasing program in Montana and the Dakotas in order to make Federally administered oil and gas resources available to the region and nation.

This assessment, an integral part of BLM's leasing program, is designed to provide the foundation and framework for the utilization of environmental considerations required in the course of issuing oil and gas leases in the three-state area by the BLM. It identifies environmental factors requiring protection and attaches appropriate stipulations on oil and gas activity to insure that protective measures are implemented.

The objectives of the BLM oil and gas leasing program are the continuation of Federal oil and gas leasing with appropriate environmental protection in areas where oil and gas development is environmentally acceptable, and identification of areas which, regardless of stipulations, are not suitable to oil and gas leasing due to environmental considerations.

The analysis required to meet these objectives will allow BLM to stratify leasing decisions according to environmental sensitivity. This stratification provides a basis for continued leasing associated with meeting the objectives of the National Environmental Policy Act of 1969 as amended and BLM's Federal Land Policy and Management Act of 1976. In practice, a lease application for a given area will be reviewed concerning: (1) The impact causing actions discussed in this chapter, and (2) the area's sensitivity to these impact causing actions. These considerations will be the basis for a decision to either lease the area with appropriate stipulations which would effectively protect the resource or not to lease because of extremely sensitive features in the area which cannot be protected with the existing range of stipulations.



Scope

The proposed action includes all practices by the BLM and the U.S. Geological Survey (GS) in issuing and administering oil and gas leases over the approximately 50 million subsurface acres under the management of the BLM in the three-state area.

Although the BLM is responsible for the leasing of Federal oil and gas under Forest Service surface, this assessment will not attempt to study environmental impacts on those lands. Instead, the BLM will refer to site-specific environmental assessment and recommendations made by the Forest Service concerning oil and gas development on land it administers. It should be noted that the BLM and Forest Service coordinate closely in these matters based upon a 1978 cooperative agreement between the two agencies. This agreement encourages coordination in order to make both agencies aware of respective roles and responsibilities concerning environmental assessment. It also insures that the analytical approach and data bases used by both agencies are compatible and will facilitate reviews and recommendations between the two agencies.

In addition to its subsurface jurisdiction, the BLM currently administers approximately 8.4 million surface acres in the three-state area. The surface and subsurface acreage administered by the BLM in each state are shown in Figure 1-1.

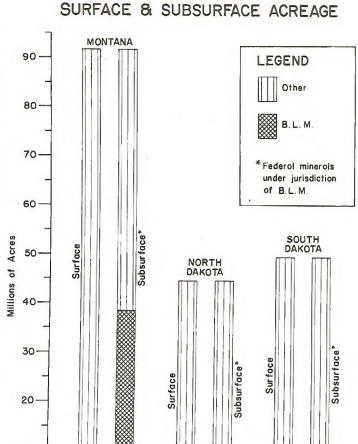
It is expected that this document can be used to assess environmental impacts from oil and gas development upon lands administered by the following agencies with surface management jurisdiction in Montana, North Dakota and South Dakota in cases where these acreages overlie Federal oil and gas subsurface:

Agency	Surface Acres
USDA - National Forest System Lands	
Region 1	18,102,368
Region 2	1,766,372
USDA-Agricultural Research Service	71,700
General Services Administration	714
USDI-Bureau of Reclamation	284,018
DOD-U.S. Air Force	8,916
DOD-U.S. Army	18,136
DOD-Corps of Engineers	607,678

In instances where the surface management agency has prepared its own site-specific analysis, this assessment will be available for reference with respect to likely environmental impacts.

FIGURE 1-1

SURFACE & SUBSURFACE ACREAGE



Source: B.L.M. IN MONTANA, U.S.D.I., 1977 & Geologist, Branch of Lands & Minerals, M.S.O.

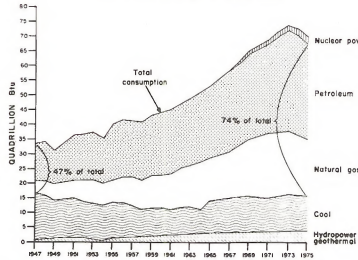
1.1 Energy Background

The United States has experienced significant changes in its political and economic well being as a result of its dependence upon inexpensive foreign supplies of energy. The Arab oil embargo of 1973 precipitated an energy "crisis" in the sense that cheap, seemingly unlimited supplies of petroleum were no longer available to the U.S. The subsequent quadrupling of crude oil prices in the period of a few months made this nation and other industrial powers aware of their dependency upon nations which hold large reserves of petroleum. Domestic oil and gas development, in conjunction with energy conservation, was encouraged in the U.S. and elsewhere with the aim of reducing dependency upon foreign energy supplies. This effort has become increasingly more important in light of recent oil price increases ($20.71 per barrel) from foreign sources and because the U.S. is currently importing approximately 50% of the oil it uses.

The United States, the world's leading energy consumer, has historically been highly dependent upon both natural gas and petroleum as energy sources. In 1975, natural gas and petroleum together comprised approximately 74% of the nation's energy diet (petroleum 45%, natural gas 29%). This is a significant increase over the 47% contribution of these two fuels in 1947. Although overall energy consumption in the U.S. grew at an average annual rate of 2.8% between the years 1947 and 1975, the continued growth in petroleum and natural gas consumption averaged 8.4% per year, or approximately three times the annual growth rate of total national energy consumption. Figure 1-2 shows the increase in total energy consumption from 1947 to 1975 and the growing role of petroleum and natural gas in satisfying this demand.

FIGURE 1-2

TOTAL U.S. ENERGY CONSUMPTION



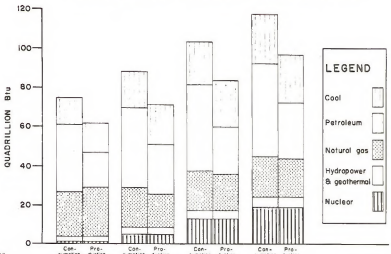
Source: Energy Perspectives 2, U.S. Department of the Interior, 1976.

It is obvious that national energy consumption would grow during this period as the nation became more populated. However, per capita energy consumption in the U.S. increased by 46% from 1947 to 1975. This means that, on the average, every individual in the U.S. in 1975 consumed approximately one and one-half times as much energy per day as in 1947. The increased growth in petroleum consumption in the United States has been made possible, to a great extent, by importing oil, and more recently liquefied petroleum gas, from other countries. Energy forecasts indicate that national consumption will continue to outstrip domestic production at least through the year 1990 (Figure 1-3).

Many areas of the world have supplied the United States' petroleum consumption during the last decade. In 1979 the U.S. was relying upon the Organization of Petroleum Exporting Countries (OPEC) for 72% of its annual oil imports (Figure 1-4). Forecasts of liquid hydrocarbon and natural gas supply through the year 2000 indicate a growth in imports of both fuels in order to keep pace with national consumption (Figure 1-5 and 1-6).

FIGURE 1-3

U.S. ENERGY PROJECTIONS, 1973-90



Source: Energy Perspectives 2, U.S. Department of the Interior, 1976.

FIGURE 1-4

SOURCES OF U.S. PETROLEUM IMPORTS*

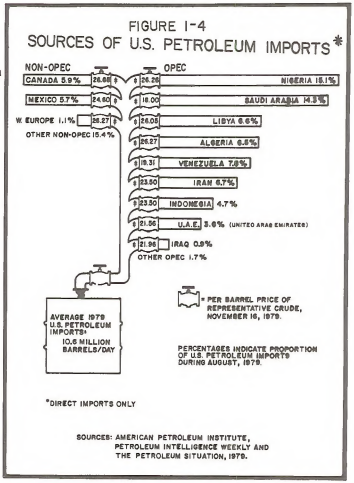
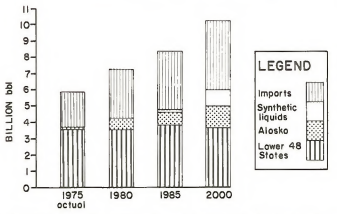


FIGURE 1–5

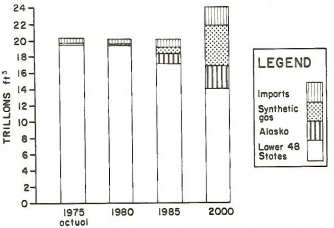
PROJECTIONS OF U.S. LIQUID HYDROCARBON SUPPLY, 1975-2000



Source: Energy Perspectives 2, U.S. Department of the Interior, 1976.
Note: U.S. Bureau of Mines estimates.

FIGURE 1–6

PROJECTIONS OF U.S. GAS SUPPLY, 1975-2000



Source: Energy Perspectives 2, U.S. Department of the Interior, 1976.
Note: U.S. Bureau of Mines estimates.

There exist many opportunities for energy conservation without a reduction in living standards in a nation which, with 6% of the worlds population, accounts for approximately 34% of the earth's annual energy consumption. This rate of energy consumption is far greater than in many other modern societies with similar standards of living.

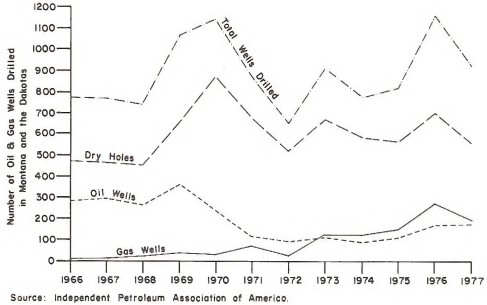
As part of a national program sponsored by the U.S. Department of Energy, Montana, North Dakota, and South Dakota have begun implementation of state energy conservation programs designed to reduce energy consumption by 5% to 6% from projected levels by the year 1985. These state programs embrace many aspects of energy conservation such as home weatherization, industrial, commercial, and residential lighting standards, thermal efficiency standards, carpooling, and the energy conservation education, to mention a few. It is likely that these programs will receive increasing attention as it becomes more apparent that energy conservation is an effective way to improve the nation's economic well-being while reducing our unnecessary dependence on foreign supplies of energy.

The oil and gas industry in Montana, North Dakota, and South Dakota is significant nationally. In 1976, Montana ranked 13th in crude oil production, with 1.1% of the nation's total, and 17th in natural gas production, producing 0.2% of the total. North and South Dakota ranked 17th and 30th, respectively, in oil production, and 19th and 50th in natural gas production. North Dakota supplied 0.9% of the nation's total crude oil production, and 0.1% of the gas production. South Dakota produced .01% of the nation's oil output, and currently has negligible natural gas production. Oil and gas activity in the study area is influenced by national trends; consequently, activity has increased with the nation's growing need for petroleum products.

Drilling activity fluctuates, but has generally been on the increase in the three-state area. As of December 1977, there were 3,330 producing oil wells in Montana, 69 wells in South Dakota, and 2,200 wells in North Dakota. Figure 1-7 shows total annual drilling activity in the three-state area from 1966 to 1977. Even though drilling activity has not changed significantly between 1966 and 1977, the actual annual production of oil and gas in Montana, North Dakota, and South Dakota decreased during the period 1967 to 1976 (Figure 1-8). Oil production decreased by 9% and gas production decreased by 8% during this period. Figure 1-9 shows that the proportion of total oil and gas production attributable to public subsurface in the three-state area is two to three times that for the nation.

FIGURE 1–7

TOTAL WELL DRILLING ACTIVITY IN THREE STATE AREA

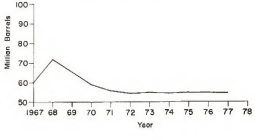


Source: Independent Petroleum Association of America.

FIGURE 1–8

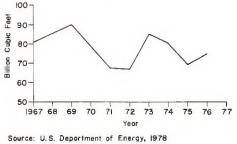
CRUDE OIL PRODUCTION

MONTANA - NORTH DAKOTA - SOUTH DAKOTA



NATURAL GAS PRODUCTION

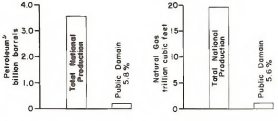
MONTANA - NORTH DAKOTA - SOUTH DAKOTA



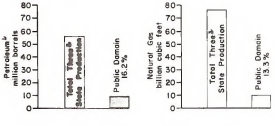
Source: U.S. Department of Energy, 1978

FIGURE 1–9

U.S. FOSSIL FUEL PRODUCTION—1976



MONTANA, NORTH DAKOTA, SOUTH DAKOTA FOSSIL FUEL PRODUCTION—1976



Source: M.S.O. Geologist, Branch of Lands & Minerals.

[a] Includes crude oil & the heavier natural gas liquids.

[b] Represents approx. 1.6% of total national production.

[b] Represents approx. 0.4% of total national production.

1.2 Summary Description of Leasing Process

Oil and gas leases fall into two basic categories—competitive and noncompetitive. Competitive leases are issued in Known Geological Structures (KGS) which are areas known to contain producible oil and gas deposits. Noncompetitive leases are issued for land outside KGSs and are available as a result either of open over-the-counter offers or simultaneous filings.

KGS land may be offered for competitive leasing based on response to public request on Bureau initiative. If this occurs, the GS then prepares a report as to KGS status, recommends whether competitive leasing is in the public interest, and groups tracts into lease parcels. If leasing is recommended, land nominated by the public is combined with other GS nominations (in active KGS areas), and a competitive lease sale is scheduled after the BLM district office is consulted concerning conflicts with land use planning. The BLM offers the tracts for lease through competitive sealed bids. The adequacy of the high bids tendered is determined by a bid evaluation team composed of representatives from the GS and BLM. Each sealed bid must be accompanied by an initial payment of 20% of the bonus offered; the remaining bonus payment must be paid prior to lease issuance.

On noncompetitive (over-the-counter) leases, the applicant files an offer to lease on lands open to lease in non-KGS areas. If, through adjudication, the lands are available for lease, the BLM district office or other appropriate surface management agency responds with appropriate land use recommendations and, upon approval, a ten year lease is issued to the applicant.

Previously leased parcels in non-KGS areas (i.e., simultaneous and noncompetitive filings) are listed monthly as they become available following expiration, cancellation or termination of the old leases. Once a list of available tracts is approved and advertised, all applications received during the filing period are considered to have been filed simultaneously. An applicant may file only one application per tract accompanied by a $10 filing fee. A drawing is held and three applications are drawn for each tract. A lease is offered on the parcel in order in which they were drawn (i.e., a winner and two alternates).

If there are no simultaneous lease offers for a tract, it becomes available to the first over-the-counter applicant subsequent to the drawing.

All leases require rent payment in advance. Rent on noncompetitive leases is $1 an acre a year. Upon production of oil and gas, the minimum royalty charge is 12.5% of value. Prior to drilling, applicant must secure bond to insurance compliance with all terms of the lease. Rent and royalty schedules on competitive leases are described in the lease agreement.

1.3 Mineral Leasing Responsibilities of BLM and GS

The BLM and GS have joint responsibility to assure full compliance with the spirit and objectives of the National Environmental Policy Act (NEPA) of 1969, Federal Land Policy and Management Act of 1976, other federal environmental legislation, and supporting Executive Orders and regulations concerning oil and gas development. Prior to lease issuance, the Bureau has the prime responsibility in the exercise of the Secretary's discretionary authority whereas the GS has prime responsibility, with concurrence from BLM relative to protection of the surface resources, after the lease is issued. Generally, GS's responsibility is confined to the "area of operations." This area can be defined as that surface including and surrounding the drill pad necessary for the drilling, subsequent development and possible production of the oil and/or gas wells in a safe and reasonable manner.

As previously mentioned, the Bureau has prime responsibility prior to lease issuance. In the exercise of this responsibility, standard stipulations have been formulated, with GS cooperation, to cover most items necessary for the protection of and subsequent rehabilitation of the surface resources. If additional stipulations are required, these are formulated and included prior to lease issuance.

After lease issuance and prior to approval of any surface disturbing activities within the area of the lease, a detailed site-specific review and field examination is conducted by the GS and BLM or other surface administering agency. From this effort, site-specific requirements are formulated for the protection of the surface resources and subsequent rehabilitation, and imposed upon the lessee prior to approval of the proposed activity (i.e., geophysical work, well drilling). Although GS has prime responsibility at this point, they must have full concurrence from the surface managing agency. If differences exist, these are forwarded through various administrative levels and eventually to the Secretary.

1.4 Federal, State and Local Actions

In order to better understand oil and gas leasing operations, the following discussion describes the responsibilities of the various governmental bodies in each phase of the operation.

FEDERAL ACTIONS

Exploration

There is no statutory authority for oil and gas exploration. Subpart 3045 of the Code of Federal Regulations (1970) established procedures to be followed in such operations.

Before geophysical operators conduct any operations on public lands, they are required to file a "Notice of Intent" with the District Manager, BLM.

The geophysical operator has a responsibility to cooperate and coordinate his operation with the District Manager. The operator's responsibilities are to:

- File a Notice of Intent on unleased lands, with maps showing proposed seismic lines and all necessary access routes before operations begin. The map should be a minimum scale of 1/2 inch to the mile.
- Be bonded.
- Notify the District Manager before he enters onto public lands.
- Obtain the District Manager's written approval for bulldozer or other dirt work.
- Notify the District Manager in writing of any changes in the original notice and secure written approval before proceeding.
- Comply with stipulations imposed by the District Manager at the pre-work conference and during field investigations.
- File a Notice of Completion.

The District Manager's responsibilities are to:

- Examine resource values and develop appropriate surface protection and reclamation measures.
- Conduct compliance inspections.
- Coordinate with the geophysical operator to explain the terms of the Notice of Intent, including operating practices to be followed or avoided, all relevant laws, and BLM administrative requirements.
- Complete final inspection after the Notice of Completion is filed. The inspection must determine that all instructions were complied with and all rehabilitation practices completed. A 90-day limit for the final inspection and notification of additional work is established by regulation. If further instructions are given to the operator at final inspection, an additional 90-day limit is established for the BLM after notification that the operator has completed his work.
- Release operator's bond.

A prospecting permit is required for geophysical work on U.S. Forest Service surface. This permitting process is similar to that used in BLM's "Notice of Intent".

Operations

Once a Federal lessee or designated operator indicates that he wishes to explore on or develop a lease, all proposed drilling operations and related surface disturbance activities must be approved before entry upon the lands involved. Approval will be in accordance with: (1) lease terms, including any additional lease stipulations; (2) Title 30 CFR Part 221, "Oil and Gas Operating Regulations," and (3) "Notice to Lessees No. 6" (NTL-6) issued by the GS effective June 1, 1976. The requirements that must be approved include the following:

Preliminary Review. A preliminary environmental review is required of all drilling proposals prior to entry on the ground to stake the location, access roads, and other surface-use areas. The operator must furnish a map of a scale not less than 1 inch equals 1 mile, that shows the preferred location and general topographic features, and explain the anticipated activity and surface disturbance to the District Engineer, GS, as well as the District Manager, BLM. This permits the district manager to identify any potential conflicts with other resource values. If conflicts are noted, a joint conference or field inspection is held involving USGS, BLM and the operator.

Application for Permit to Drill. Prior to drilling or road construction on a Federal lease, the operator must submit an Application for Permit to Drill (APD). The APD includes a Surface-Use and Operations Plan. Where private surface is involved, it should include a copy of the written agreement between the lessee or operator and the surface owner. A letter from the lessee or operator setting forth rehabilitation requirements agreed to with the surface owner is acceptable.

The APD provides operational and geologic information required by the GS. The Surface-Use and Operations Plan must allow assessment of the environmental effects expected from the proposed project. Bonding coverage must be obtained by the applicant before approval of the APD by GS.

GS sends this information to the BLM District Manager, who reviews the plan and recommends surface-protection stipulations for the approved permit. The BLM must decide at this time if it desires to obtain the well as a water well if oil or gas is not encountered in usable quantities.

Approval of Operations. Before repairing, deepening or conditioning an existing well, a detailed written work plan must be submitted to GS.

In existing fields operators are required to submit, for GS approval, plans for new construction, reconstruction, or alteration of existing facilities, when additional surface disturbance will result.

Abandonment. Well abandonment requires prior approval by the GS and the BLM, which may require additional surface rehabilitation. These requirements are normally part of the approved abandonment plan. Abandonment will not be approved until surface rehabilitation work required by the drilling permit or abandonment notice is complete, and required vegetation is established to the satisfaction of the BLM District Manager.

Water Well Conversion. If the BLM decides to acquire the well as a water well, it must assume responsibility at the time of abandonment. The operator will plug the well at the bottom of the desired fresh-water zone and leave casing in place. The operator then will begin surface cleanup as required. The BLM must reimburse the operator for casing and labor to complete the well.

Other Requirements

The Environmental Protection Agency has issued regulations affecting all oil and gas lessees and operators (Title 40 CFR, Part 112). These regulations require owners or operators to prepare Spill Prevention Control and Countermeasure (SPCC) Plans. EPA does not make special inspections to see that operators have SPCC Plans. They may call for one from an operator if they desire; if an operator does not provide one, he is subject to a fine. After a hazardous material spill, EPA usually calls for the operator's SPCC Plan.

Oil and gas operators must also meet requirements of the Department of Transportation and the Interstate Commerce Commission.

Table 1-1 summarizes the seven basic procedural steps necessary in obtaining a Permit to Drill for oil and gas on Federal leases.

STATE ACTIONS

If a well is productive, the state requires notification and a monthly report. A completion or recompletion report is also required. The Oil and Gas Conservation Commission in Montana, the Industrial Commission of North Dakota and the South Dakota Board of Natural Resources are primarily interested in production and conservation of the oil and gas. Surface protection requirements are a matter between the surface owner and the operator. The State Commissioner of Public Lands issues state leases and also holds operator's bonds. He releases such bonds whenever the surface owner or lessee is satisfied. Monetary settlement is acceptable to the state in lieu of rehabilitation. If a well is a dry hole, operators are required to follow state procedures for plugging.

The above mentioned agencies have final authority on any well location variances. They also must approve unitization agreements. In addition, the states control water and gas injection systems, and underground gas-storage projects. The GS works with them on this, although the state has final authority.

Oil and gas operators are regulated by the State Department of Environmental Quality. This Department issues burning permits, if needed, as well as production-water discharge permits.

LOCAL ACTIONS

County governments are involved with oil and gas operators with respect to zoning, rights-of-way, and access.

The petroleum industry is very active in the study area. The headquarters of the Petroleum Association of Montana, located in Billings, is the state chapter of the Rocky Mountain Oil and Gas Association (RMOGA), headquartered in Denver. The major producers in the area belong to this association.

1.5 Phases of Onshore Oil and Gas Activity

Normally, onshore oil and gas operations progress through five phases: (1) Preliminary exploration, (2) Exploratory drilling, (3) Development, (4) Production and (5) Abandonment. Preliminary exploration can occur on leased or unleased lands. The remaining four phases occur on leased lands. Each phase has a potential for causing some type of disturbance to the environment. A brief description of the purpose for each phase and those actions within a phase that could cause some type of environmental disturbance follows.

PRELIMINARY EXPLORATION

A clue to the presence of oil and gas may be revealed by a search for geological structures within the rock that may contain underground oil and gas "traps". Figure 1-10 shows typical structures that may contain oil or natural gas traps.

Surface maps and aerial photos help the geologist identify geologic structures. Additional data can be gathered by the use of aircraft. Low altitude reconnaissance flights, frequently at elevations of 100 to 500 feet, help identify rock outcrops that can be studied later on the ground. Higher altitude flights above 3,000 feet are often made to conduct photographic, geophysical magnetometer and other sensing surveys.

On-the-ground geologic mapping, gravitational and magnetic prospecting may follow if the previous work shows promise of oil and gas traps or reservoirs. Figure 1-11 shows how the gravity methods works. Small trucks and jeeps with crews of several people can be used at this stage of subsurface data gathering, and off-road travel is likely.

If the information gathered is still indicative of structures conducive for oil and gas reservoirs, seismic prospecting may follow. A seismic survey is a method

TABLE 1-1

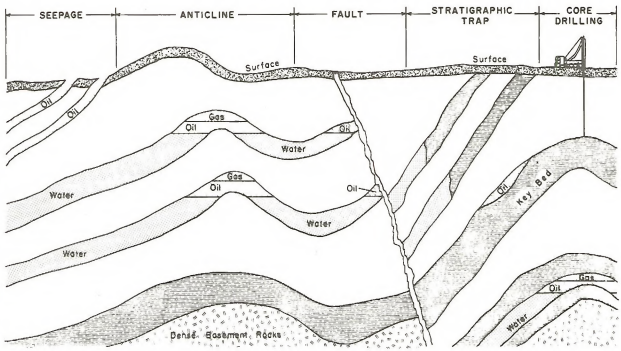
PROCEDURAL GUIDELINES FOR ACTIONS ASSOCIATED WITH OIL AND GAS DEVELOPMENT

	Operator Action	Dept. of Interior Action	Field Activities	Normal Time Period
STEP I	1. Develops preliminary map and submits to GS and Bureau of Land Management. 2. Identifies necessary off lease rights-of-way. 3. Attends joint field examination if requested by Interior.	1. Performs preliminary environmental review. 2. Reviews for other authorizations necessary. 3. Notifies operator if site conflicts with other resource values. Notifies operator if no archaeological survey is required. 4. Requests joint field examination if necessary.	1. Operator reviews on-the-ground site. 2. Joint field inspection, if necessary.	1. 15 days after receipt.
STEP II	1. Operator surveys well location and centerline of access roads. 2. Identifies necessary off lease rights-of-way. 3. Arranges for archaeological clearance work. 4. Develops Multi-point Surface Use & Operations Plan. Prepares Application for Permit to Drill. 5. Acquires private surface owner agreement if appropriate.		1. Survey and stake well site and other facilities, includes centerline staking of roads. 2. Archaeological survey performed.	1. Variable; contingent upon operator schedules.
STEP III	1. Operator files APD, Multi-point Surface Use & Operations Plan, Private Surface Owner Agreement, and archaeological clearance. 2. Applies for necessary rights-of-way to Bureau of Land Management. 3. Attends joint field examination if requested by GS.	1. Reviews APD and Surface Use & Operations Plan. 2. Reviews archaeological survey. 3. Requests joint field examination, if appropriate. 4. Requests revision of plan if unacceptable. 5. Prepares necessary environmental analysis for APD and other federal actions required. 6. Prepares conditions of approval to APD and Multi-point Surface Use & Operations Plan. 7. APD approved or rejected. 8. Appropriate rights-of-way issued.	1. Joint field examination performed.	1. 30 days.
STEP IV	1. Performs in accordance with approval plan. 2. Files necessary reports to Geological Survey.	1. Compliance inspections.	1. Operator stakes well site exterior dimensions. 2. Operator begins construction and/or drilling activities. 3. Interior conducts compliance inspections.	1. Variable.
STEP V	1. Operator files Notice of Completion if well is a producer, plus modification to the Multi-point Surface Use & Operations Plan. Operator may need to arrange for additional archaeological survey on areas affected by plan modifications. 2. Operator files Notice of Intent to Abandon if well is dry hole. This can also be for a producer that has gone dry.	1. Reviews on-the-ground conditions for compliance and rehabilitation needs. 2. Reviews modifications to the Multi-point Surface Use & Operations Plan. 3. Requests joint field examination, if appropriate. 4. Requests revision of plan if unacceptable. 5. Prepares necessary environmental analysis for the plan and reviews archaeological survey. 6. Prepares conditions of approval to modified plan. 7. Plan approved or rejected. 8. Additional requirements for rehabilitation of disturbed areas developed for conditions of Intent to Abandon.	1. Joint field examination if necessary. 2. Field work performed to develop well and necessary 3. Field work performed to abandon well if this is the action. 4. Rehabilitation work begins on disturbed areas.	1. Review of plan, 30 days. 2. Rehabilitation work, one year.
STEP VI	1. Operator files Sundry Reports on a Well. Subsequent Report of Abandonment states all work is completed and ready for inspection.	1. Performs compliance checks to see that all conditions are met. 2. Approves final abandonment.	1. All work completed and ready for inspection.	1. Vairable; one-two years for vegetation establishment.
STEP VII	1. Applies for release of the period of bond liability.	1. Performs final check, if necessary. 2. Approves release of the bond liability.	1. Possible field inspection by Bureau of Land Management.	1. 30 days.

SOURCE: Surface Operating Standards for Oil and Gas Exploration and Development, Second Edition 1978.

FIGURE 1–10

TYPICAL OIL AND GAS TRAPS



Source: U.S. Department of the Interior, Plain Facts about Oil, 1963.

of gathering subsurface geological information by recording impulses from an artifically generated shock wave. The common procedure used in reflection seismic surveys on land consists of creating a shock wave, and recording, as a function of time, the resultant seismic energy as it arrives at a group of vibration detectors (seismometers) arrayed on the ground surface. Portions of the seismic energy reach the seismometers by several different routes. One portion spreads over the ground as a surface wave. Another travels along a subsurface layer and is refracted to the surface. A third travels downward until it reaches an abrupt change in lithology of rock characteristics and is then reflected back to the surface (Figure 1-12).

Seismic methods are usually described by the various methods of generating the shock wave. Seismograph units mounted on trucks are used to detect shock waves in the earth generated by thumpers, vibrators or explosives. Ground vibrations are made by thumpers by dropping a steel slab weighing about three tons to the ground several times in succession along a predetermined line. The weight is attached by chains to a crane on a special truck. A typical thumper unit is shown in Figure 1-13.

The vibrator method is widely used and is replacing the explosive method. Typically, four large trucks are used, each equipped with a vibrator mounted between the front and back wheels (Figure 1-14). The vibrator pads (about four feet square) are lowered to the ground and vibrators on all trucks are triggered electronically from the recorder truck. After the information is recorded, the trucks move forward a short distance and the process is repeated.

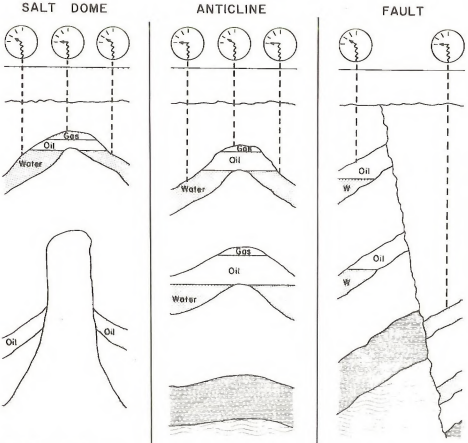
Explosives have been widely used in the past to generate the seismic impulse or shock wave. Traditionally, the explosive charge is detonated at the bottom of a drill hole of 200 feet or less. Recently, however, techniques of detonating the explosives on the surface have been developed that give good results in some areas.

Subsurface charges are usually placed at the bottom of a 4 to 6 inch hole drilled with a truck-mounted drill. Access suitable to allow the drill and recording trucks to travel across the surface is required. Detonation of the charge in some areas causes no surface disturbance while in other areas a small crater (up to 6 feet in diameter) is created (Figure 1-15). Cuttings from the well are normally hauled to a suitable disposal site, scattered by hand near the "shot hole," or disposed of in the hole. Bentonite mud is often used to plug the surface of the shot hole.

Where access limitations, topography or other restraints prevent use of truck mounted drill rigs or recording trucks, lightweight portable equipment can be used. Various kinds of portble drills can be backpacked or delivered by aircraft to the area. These portable operations use a pattern of holes drilled to a depth of about 25 feet. All of these holes are loaded with explosives and detonated simultaneously.

FIGURE 1–11

GRAVIMETER



Gravity is slightly less over the salt dome because salt is lighter than the surrounding rocks.

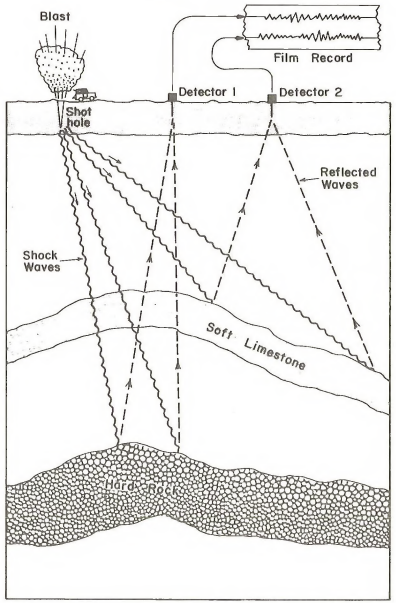
Gravity is slightly stronger over the top of the anticline because the denser basement rocks are nearer the surface.

Gravity is slightly greater on the raised side of the fault because dense rock is closer to the surface there.

Source: U. S. Department of the Interior, Plain Facts about Oil, 1963.

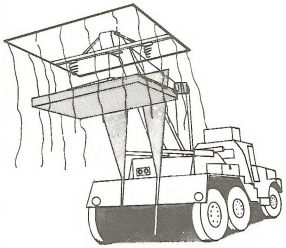
FIGURE 1–12

SEISMOGRAPH



Source: U.S. Department of the Interior, Plain Facts about Oil, 1963.

FIGURE 1-13
THUMPER



Thumper in action shows 6,000 pound steel slab, surrounded by safety chains to warn personnel, falling nine feet to strike earth and create shock waves. Weight-dropping aids the oil search as an effective economical substitute for dynamite in seismic operations.

Source: A Primer of Oilwell Drilling, University of Texas at Austin, 1976.

FIGURE 1-14. VIBRATOR TRUCKS DURING SEISMIC OPERATION.
SOURCE: BLM

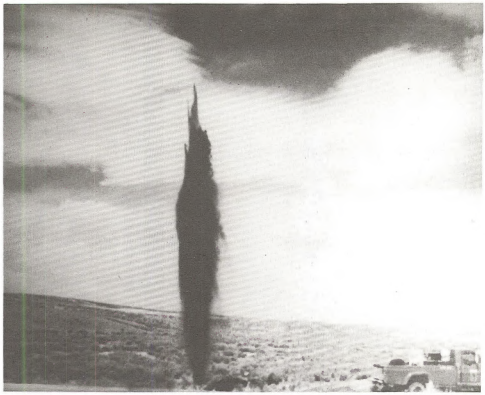


FIGURE 1-15. SHOT HOLE DURING SEISMIC OPERATION.
SOURCE: BLM

Surface charges can be placed directly on the ground surface, on the surface of snow, or on a variety of stakes or platforms. Paper cones, survey stakes, lath or 2 x 4's up to 8 feet in length have been used with varying success in different areas. Use of tall stakes or explosives placed on the surface of two feet or more of snow results in good seismic data in some areas, while creating no visible surface disturbance.

The vibrations or waves traveling through the ground are recorded by seismographic units some distance away at several locations. The seismic sensors and energy source are located along lines on a one to two-mile grid. Existing roads are used if possible. Lines may require clearing of vegetation and loose rock to improve access for the trucks. Each mile of line cleared to a width of 8-14 feet represents disturbance of about an acre of land.

In remote areas where there is little known subsurface data, a series of short seismic lines may be required to determine the regional dip and strike of subsurface formations. After this, seismic lines will be aligned with these formations to make seismic interpretation more accurate. Although alignment may be fairly critical, spacing of the lines can often be changed up to a quarter of a mile on a one-mile grid, before the results will affect the investigation program.

A network of low standard temporary roads and trails can result from this operation. Level topography with few trees and shrubs would require little or no road construction. An area with rugged topography and larger vegetative types such as trees and large shrubs would require more road preparations. Temporary roads and trails are usually constructed with bulldozers. The surface is cleared by removing vegetation and loose mineral material. Small streams and gullies are crossed by filling in the channel after placement of an appropriate culverts or by dozing out the stream banks to provide a dip or gradual transition to enable equipment to cross. The alignment of these roads consists of straight lines, usually with little regard for gradient or steep slopes or rough terrain being traversed.

A typical seismic operation may use 10 to 15 men and five to seven trucks. Under normal conditions, three to five miles of line can be surveyed each day using the explosive method; five to ten miles are about average for a vibrator crew. The crews often work 70 to 80 hours a week in good weather.

If preliminary investigation on BLM lands does not result in significant impacts on the surface, the operator need not notify the district BLM office. However, if the investigation will create noticeable impacts (e.g., road construction or ground clearing), as it could in seismo-

graph prospecting, the operator must be properly bonded and must file a Notice of Intent. Bonds may be in the form of a rider on existing nationwide or statewide oil and gas bonds. BLM personnel will then examine resource values in the area and stipulate appropriate surface protection and reclamation requirements. The operator notifies the district manager before entry onto the land. It should be noted that the U.S. Forest Service requires a Prospecting Permit for virtually any oil and gas activity on lands it administers.

During preliminary investigation, the operator will comply with the stipulations for surface protection and reclamation. The BLM is responsible for checking this compliance. The operator notifies the district of any proposed changes in his activity. At the end of the investigation, the operator files a notice of completion, the BLM makes a final inspection, and, if all requirements have been met, the operator's bond is released.

Since no statutory authorization is required for entry on the land, avoidance of adverse impacts is dependent on the cooperation of oil and gas exploration operators. However, rehabilitation of damage can be required by the government.

EXPLORATORY DRILLING

Drilling does not begin until a lease has been acquired by the operator. In cases where preliminary investigations are favorable and warrant further exploration, exploratory drilling may be justified. Figure 1-16 shows a typical exploratory rig working in prairie country. More precise data on the geologic structure is obtained by stratigraphic tests using shallow drill holes.

Additional subsurface information revealing the nature of near surface structural features may be obtained by drilling holes to depths of 2,000 to 3,000 feet or deeper. Drilling is accomplished primarily by rotary drill rigs. Rock chips and cuttings are brought to the surface from the bottom of the drill hole by high-pressure air flow or a flow of drilling mud. The chips and cuttings are collected, bagged, and identified as to depth of their origin. The chips are then examined to determine their composition and age, which helps to identify the formation and structure from which the chips originated. This kind of information will help the geologist find a marker zone or formation to correlate the previously obtained geologic and geophysical information to actual structures.

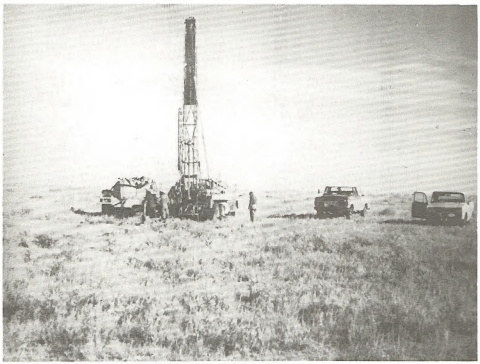


FIGURE 1-16. EXPLORATION DRILL RIG.
SOURCE: BLM

Temporary roads good enough to accommodate truck mounted drill rigs, water trucks, and other service equipment must be constructed. Where level, solid ground exists, little road construction is usually necessary. In hilly or mountainous areas, more road building would be necessary. Figure 1-17 shows an oil and gas access road in a mountainous area.

A space of about one-half acre or less is leveled and cleared of vegetation for the average drill site. If high pressure air is used to remove rock chips or rock cuttings, rock dust may be emitted to the air when samples are not being collected. If mud is used as a drilling fluid, mud pits may be excavated; more commonly, portable mud tanks are used. Usually, one to three days are required to drill the test holes.

FIGURE 1-17. ROAD BUILT DURING EXPLORATORY ACTIVITY.
SOURCE: BLM

Oil and gas are found in small spaces in porous rock somewhat like water in a sponge. It seeps slowly through the porous material until it is trapped by impervious rock, often appearing as a layer between water and gas. The preliminary exploration is done in an attempt to tentatively locate these traps. If preliminary exploration still indicates the possible existence of oil and gas, a "wildcat well" (i.e., a well drilled outside of a KGS) will be drilled into the suspected zone to determine if in fact the oil and/or gas are present and if its quality and quantity is adequate for profitable sale.

Nationally, approximately 1 out of every 16 wildcat wells produce significant amounts of oil or gas. Only 1 out of 140 wildcat wells produces enough to be financially successful. In recent years, success ratios for the three-state study area were considerably higher. During 1977, Montana's wildcat success rate was 25%, North Dakota's rate was 17% and South Dakota's rate was 32%.

The depth of wildcat wells depends on the geology of an area. In the Williston Basin and Overthrust Belt areas, wells are commonly drilled to a depth of 10,000 feet or more. Drilling equipment could remain on this type of site for six months, while in other areas such as the northern part of Montana, shallower wells up to a few thousand feet are common and may be completed in a few weeks.

Prior to drilling, an area or drill pad must be cleared and leveled for drilling equipment. The well site, usually one to four acres, is cleared of all vegetation and graded nearly flat for the drilling rig, mud pumps, mud pit, generators, pipe rack and tool house. Other facilities such as storage tanks for water and fuel are located nearby.

From 50,000 to 100,000 gallons of water a day may be needed for mixing drilling mud, cleaning equipment, cooling engines, etc. A surface pipeline may be laid to a stream or a water well or the water may be trucked to the site.

A drilling rig may be moved from one site to the next after being dismantled. In some instances, rigs can be skidded short distances in level terrain which will shorten the tearing down and rigging up time. Moving a dismantled rig involves use of heavy trucking equipment for transportation and crews to erect the rig.

In order to move a drilling rig from one drill site to another, temporary roads with a capacity sufficient to haul the drill rig, well service equipment, and to accommodate continuous traffic to and from the drill site are built (Figure 1-18). Time of year, topography, and duration of drilling activity are other factors which influence how the road is constructed.

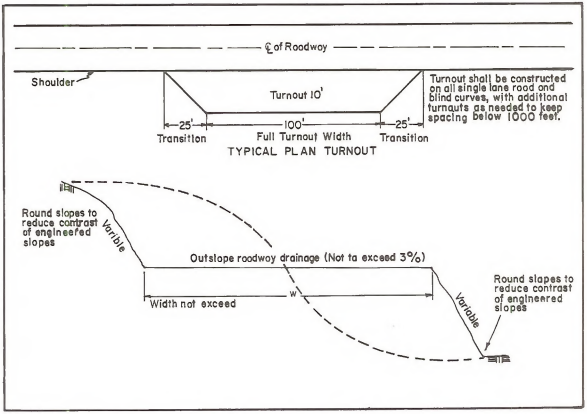
FIGURE 1-18. TEMPORARY ROAD BUILT FOR HAULING DRILLING EQUIPMENT FROM ONE SITE TO ANOTHER.
SOURCE: BLM

Typically, a temporary road would not exceed 16 feet in width. In general, temporary roads should be designed for the minimum width needed for the activity. Turnouts, as shown in Figure 1-19, are made on single lane roads, blind curves, and approximately every 1,000 feet along the road. In hilly or mountainous areas, it may be necessary to cut and fill slopes. Cut slopes up to 3:1 (three feet horizontal and one foot vertical) and fill slopes of 2:1 are common. Construction of a road 16 feet wide would require approximately 1.9 acres per mile of road.

A single lane road with a ten foot wide running surface would require about 1.5 acres of surface per mile, plus road cuts and fills. In hilly and mountainous areas, the surface areas required for a road would increase depending on the topography and the number of cuts and fills. Bulldozers, maintainers and other types of heavy construction equipment would be needed to construct and maintain temporary wildcat well roads. A part of this activity would include necessary culvert installation, setting of timbers, etc.

FIGURE 1—19

TEMPORARY ROADS



Drilling is started by "spudding in" the well; that is, starting the hole. Oftentimes, a short piece—10 to 12 feet—of conductor pipe is forced into the ground. Conductor pipe may be cemented by hand, driven into place using a piledriver, or it may be cemented in a hole drilled in the usual manner. The initial drilling usually proceeds rapidly and generally the string of surface casing is set before harder, deeper formations are encountered. The surface casing is a long length of steel pipe which is cemented into the well to protect against water or rock getting into the hole. It is smaller in diameter than the conductor pipe but large enough to allow subsequent lengths of casing to be set as the well is deepened. Also, surface casing provides for attachment of blowout preventers that are necessary in case a zone containing high-pressure gas, water, or oil is encountered. Without blowout protection, the contents of this zone could blow all the drilling mud out of the well (Figure 1-20).

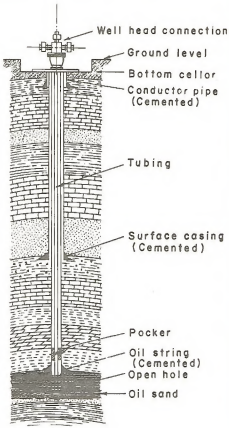
During or at the completion of drilling, the well is logged. Logging involves the measuring of physical characteristics of the rock formations and associated fluids, with instruments lowered to the bottom of the well. As the equipment is raised to the surface, the instruments record various data from each formation of interest. After study of the well logs and drill stem test data, the geologist decides whether the well has encountered sufficient quantities of oil or gas in a pay zone to warrant completion of the well.

Completion requires installation of steel casing between the surface casing and the pay zone. The casing is selectively cemented, to provide stability and to protect specific zones, and then perforated adjacent to the suspected producing formation. If the formation produces oil or gas, the area is developed. If the formation does not produce, the well may either be extended to a greater depth or abandoned.

During 1977, 259 wildcat wells were drilled in the three-state study area. Other drilling activity was in known fields.

FIGURE 1–20

WELL CUTAWAY VIEW



Source: Primer of Oil & Gas Production, American Petroleum Institute, 1978.

DEVELOPMENT

If a wildcat well becomes a "discovery" well (i.e., a well that yields commercial quantities of oil and gas), other wells are drilled to locate the boundaries of the field and to facilitate planning the best pattern of wells to drain the reservoir. As with wildcat wells, a field development will be staked and its exact location determined by surveyors, relative to land boundary lines and other geographic "fixes" tied into the geophysical surveys.

If the well is completed as a free-flowing well, the wellhead is simply closed off using a device known as a "Christmas tree" which consists of various valves and pressure regulators which are used to control oil or gas flow to facilities used in the production phase. If the well is a gas discovery, the operator is allowed to flare gas for a short period of time to determine capacity before shutting the well in or connecting the well to gas gathering pipelines.

Quite often, however, the producing zone will not have enough pressure to force the oil to the surface. In this situation, the oil must be pumped to the surface using "artificial lift" methods. When pump installation is complete, the well normally is tested for a period of days or months to determine whether the producing zone is adequate to support additional wells. More detailed seismic lines tying previous lines to the discovery well may be required. The discovery well may also be studied to draw upon previous seismic work and provide more accurate subsurface data.

A temporary well spacing pattern must be established before development drilling begins. Information considered in establishment of a spacing pattern includes data from the discovery well concerning porosity, permeability, pressure, composition and depth of formations in the reservoir; well production rates and type (predominately oil, or predominately gas); and the economic effect of the proposed spacing on recovery.

Oil and gas well spacing, established by the state with concurrence from GS, can be from a few acres per well to a section or more. In general, well density for gas wells is much less than that for oil wells. Typically spacing restrictions require that gas wells be sited on 160 acres or more while oil wells can be sited on tracts of 40 acres or more. This implies that, generally, a maximum of 16 oil wells or 4 gas wells can be located on one section (640 acres) of land.

Surface use in an oil and gas field also may be affected by unitization of the leaseholds. In many areas containing Federal lands, an exploratory unit is formed before a wildcat is drilled. The boundary of the unit is based on geologic data. The developers "unitize" the field by entering into an agreement to develop and operate it as a unit, without regard to separate ownerships. Costs and benefits are allocated according to agreed terms.

Unitization reduces the surface-use requirements because all wells are operated as though on a single lease. Duplication of field processing facilities is minimized, because development and operations are planned and conducted by a single unit operator. Unitization may also involve wider spacing than otherwise, resulting in fewer wells and roads.

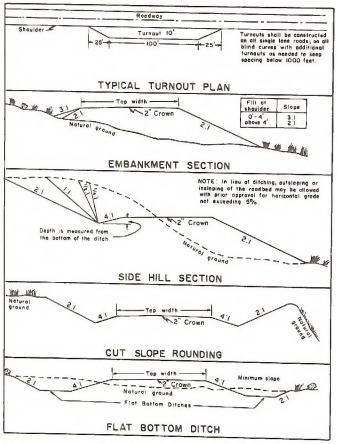
The rate at which development wells are drilled depends on such factors as whether the field is on a lease basis or unitized, the probability of profitable production, the availability of drilling equipment, protective drilling requirements and the degree to which limits of the field are known.

Once well spacing has been approved, the operator plans development of the lease. The procedures for drilling development wells are about the same as those for wildcat wells, except that there is usually less subsurface sampling, testing, and evaluation. Surface uses for development drilling may include access roads, well sites, flowlines, storage tank batteries, facilities to separate oil, gas, and water and injection wells for saltwater disposal.

Normally, access roads are limited to one main route to serve the lease area with a maintained road to each well. Typically, roads are constructed to standards shown in Figure 1-21. Upgrading of temporary roads may include ditching, draining, installation of culverts, gravelling, crowning or capping the roadbed. Surface area needed for roads would be similar to temporary roads and also dependent on how level or hilly an area may be.

FIGURE 1-21

TYPICAL ROAD SECTIONS



Source: Bureau of Land Management, 1977.

When an oil field is developed on the spacing pattern of 40 acres per well, the wells are approximately 1,320 feet apart in both north-south and east-west directions. If a section (a square mile) is developed with 16 wells, at least four miles of access roads are built. Although the size of most fields ranges from less than 1,000 acres to several thousand, a few major fields cover several townships. If a major field is discovered and developed on a 40-acre well spacing pattern, a township may have 576 wells and over 200 miles of road.

The most important factor in further development may be the quantity of production. If the discovery well has a large capacity and substantial reserves are indicated, development drilling may occur at a much slower pace. An evaluation period to observe production performance may follow between the drilling of successive wells.

Development on an individual lease basis may proceed more rapidly than under unitization, since each lessee must drill his own well to obtain production from the field. On a unitized basis, however, all owners within the participating area share in a well's production regardless of whose lease the well is on.

Drilling in an undeveloped part of a lease, to prevent drainage of petroleum to an offset well on an adjoining lease, is frequently required in fields of intermingled federal and privately-owned land. The terms of federal leases require such drilling or compensatory royalty if the offset well is on nonfederal lands, or on federal lands leased at a lower royalty rate.

Many fields go through several development phases. A field may be considered fully developed and produce for several years, then wells may be drilled to a deeper pay zone. Discovery of a new pay zone in an existing field is a "pool" discovery, as distinguished from a new field discovery. A pool discovery may lead to the drilling of additional wells—often from the same drilling pad as existing wells—with the bore holes separated only by feet or inches. Existing wells may also be drilled deeper.

PRODUCTION

Production in an oil field begins soon after the discovery well is completed and often concurrently with development operations. Temporary facilities may be used at first, but as development proceeds and reservoir limits are learned, permanent facilities are installed. The extent of such facilities is dictated by the number of producing wells, expected production, volume of gas and water produced with the oil, the number of leases and whether the field is to be developed on a unitized basis.

Production in a gas field does not begin until the pipeline to a market has been constructed. Sales pipelines are not justified until sufficient gas reserves are proved by drilling operations. Gas wells are often shut-in after completion for periods ranging from months to years until pipeline connections are available.

Some natural gas contains hydrogen sulfide which is a highly toxic and flammable gas. Presence of hydrogen sulfide in a formation can cause problems while drilling, as well as during production. High carbon steel, used for drilling and casing deep holes due to its high strength, will shatter like glass when exposed to high concentrations of hydrogen sulfide. Natural gas containing significant amounts of hydrogen sulfide is known as "sour gas." The hydrogen sulfide must be removed before the gas enters a commercial pipeline. If sour gas is produced in quantities insufficient to justify this removal, it must be flared. If combustion during flaring is complete, only sulfur dioxide is emitted into the air. If incomplete combustion occurs, other sulfur compounds including hydrogen sulfide are emitted into the air. Oil wells producing from formations containing hydrogen sulfide represent a hazard to personnel if dissolved hydrogen sulfide is present in the oil. Hydrogen sulfide smells like rotten eggs in low concentration, but prolonged exposure tends to dull the sense of smell. Hydrogen sulfide is heavier than air and will concentrate in low-lying areas and depressions. Under certain conditions, it can form an explosive mixture with air in concentrations over four percent by volume. Drill crews are aware of this problem and take precautionary measures to avoid this occurrence. Gas sweetening plants may be built to produce elemental sulfur from hydrogen sulfide in the natural gas.

Most wells in the three state study area require an artificial lift to bring the oil to the surface. Pumping and a technique known as "gas lift" are the two artificial lifts used. Naturally flowing wells and wells with gas lift facilities use a minimum of equipment at the surface and produce little or no sound. All surface pump systems require more surface equipment and make more noise than flowing wells and gas lift facilities.

Surface pumps are usually powered either by electric motors or internal combustion engines. Operators prefer electric motors because they make less noise, require less maintenance, involve less fire hazard, are more dependable and can be more easily automated than internal combustion engines. However, internal combustion engines must be used in many oil fields where electric power is not available. If there is sufficient casing head gas (natural gas produced with the pumped oil), or another gas source is available, it may be used to fuel internal combustion engines. Butane and propane are also used as fuels. Single-cylinder engines operate at high noise levels, whereas multi-cylinder engines operate at lower noise levels.

Most existing wells in the three-state area have weak water pressure and require pumping. Both surface and subsurface (submersible) pumps are used; however, subsurface pumps are much less common. The horsehead pump (Figure 1-22) is most commonly used in the Lewistown District.

Surface units used with sucker rod pumps are fitted with guard rails, belt drive shields and fences for safety. These pumps, as well as the accompanying tanks and other facilities, can be painted in earth tone colors to blend with the landscape.

Gas lift is used in some oil field where high pressure natural gas is available and where pressure in the petroleum reservoir is sufficient to force the petroleum part of the way up the well. The addition of gas lowers the specific gravity of the petroleum so that it flows to the surface. However, this method will be used less in the future as supplies of high pressure natural gas decline.

Most gas wells produce by normal flow and do not require pumping. Surface use at a flowing well is usually limited to a 20-foot by 20-foot fenced area containing a gas well Christmas tree. If water enters a gas well and chokes off the gas flow, a pump may be installed to pump off the column of water. After the water is removed, the gas flows to the surface until water chokes it off again. Some gas wells may require almost continual water pumping.

Crude oil is usually transferred from wells to a central storage tank battery (Figure 1-23) before it is transported from the well site by truck or by pipeline.

Natural gas is often sold at the wellhead and transported directly off the lease. If processing is required to remove liquid hydrocarbons or water, however, the gas may be transferred to a central collection point prior to sale. On some leases, the production from several wells is piped to a central gathering station and then piped in a larger line to the storage batteries.

Pipelines used within the field are commonly from 4 to 6 inches in diameter between the well and gathering station. Pipelines between the gathering tanks and treating stations may be 4 to 8 inches in diameter. These pipelines may be buried without a protective coating in areas where soils are not corrosive. Briny water mixed with the oil can also corrode pipelines, causing them to wear out and develop leaks more rapidly. Such leaks are easier to detect and repair if the pipelines are placed on the surface rather than underground.

If the oil contains gas and water, they are separated before the oil is stored in the tank battery. The treating facilities are usually located at a storage tank battery (Figure 1-24).

Low pressure petroleum that must be pumped from the well is normally treated in a single separation; high-pressure flowing petroleum may require several stages of separation with a pressure reduction accompanying each stage.

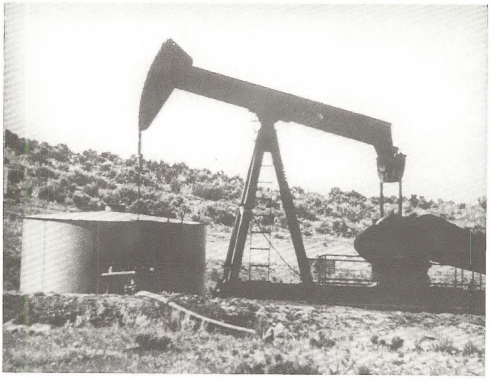
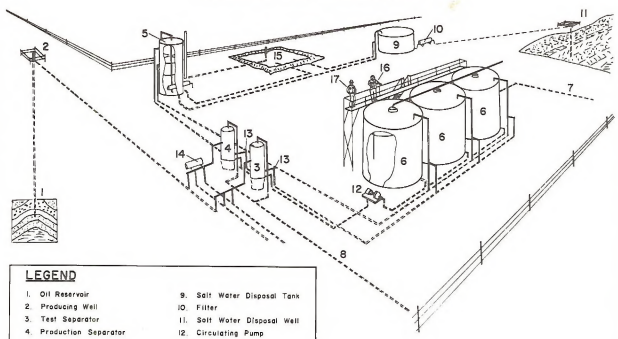


FIGURE 1-22. HORSEHEAD PUMP USED FOR SECONDARY RECOVERY.
SOURCE: BLM

FIGURE 1-23

FLOWING OIL PRODUCTION



LEGEND

1. Oil Reservoir
2. Producing Well
3. Test Separator
4. Production Separator
5. Flow Treater
6. Stock Tank
7. Crude Oil Gathering Line
8. Gas to Gasoline Plant, Sales, or other uses
9. Salt Water Disposal Tank
10. Filter
11. Salt Water Disposal Well
12. Circulating Pump
13. Gas Meter
14. Chemical Injection
15. Emergency Salt Water Pit
16. Pipeline Gauger
17. Lease Pumper

Source: U. S. Department of Interior, 1963.

FIGURE 1-24. OIL TREATMENT FACILITIES SURROUNDING STORAGE TANKS. SOURCE: BLM

If enough casinghead gas is separated in the field to make it economical to process it for marketing, a plant may be built to remove gasoline, butane, and propane. Some of the remaining gas is used to fuel the plant and the remainder is sold. If the volume of casinghead gas produced in a field is insufficient to warrant treatment in a gas plant, it is usually used as fuel for pump engines in the field and as heating fuel for oil treaters. If the gas exceeds fuel requirements on the lease, it may be flared or vented to the atmosphere.

If water is produced with the petroleum, it is separated before the gas is removed. In primary operations, where natural pressures or gravity cause the petroleum in the reservoir to flow to the wells, the degree of mixing usually is high enough to require chemical and heat treatment to separate the oil and water. Heat applied to the bottom of the treaters breaks the emulsion. The heat is supplemented in most cases by chemical emulsion breakers.

In secondary production, where water injection or other methods are used to force additional petroleum to the well bore, the oil and water often are not highly emulsified. In this case, the oil and water may be separated by gravity in a tall settling tank. Water injection may require additional wells and maintenance roads.

After the oil and water are separated, the oil is piped to storage tanks located on or near the lease. There are normally at least two tanks so that at least one tank can be filled as the contents of the other are measured, sold, and transported. The number and size of tanks vary with the rate of production on the lease, and with the extent of automation in gauging the volume and sampling the quality of the tank's contents.

Although most produced waters are brackish to highly saline, some are fresh enough for beneficial use. In the past, ranchers have filed claims on oil field water so they can use it for agricultural or livestock purposes. Montana, North Dakota and South Dakota law require that disposal permits be obtained from the Department of Health and Environmental Sciences, Department of Health, and Department of Environmental Protection, respectively. The discharged water must meet certain water quality standards.

Because water may not come from heater-treaters completely free of oil, oil skimmer pits may be established between separating facilities and surface discharge.

When salt water is disposed of underground, it is usually introduced into a formation containing water of equal or poorer quality. It may be injected into the producing zone from which it came or into other producing zones. In some cases, this stimulates oil production. In other cases, it could reduce the field's productivity and may be prohibited by state regulation or mutual agreement of the operators.

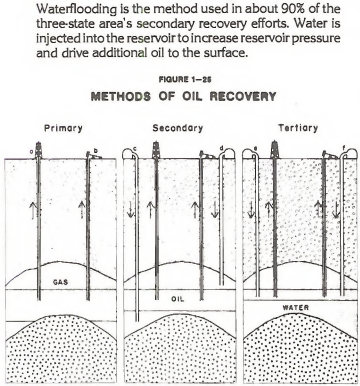
In some fields, dry holes or depleted producing wells are used for salt water disposal; occasionally, new wells are drilled for disposal purposes. Cement is squeezed between the casing and sides of the well to prevent the salt water from migrating up or down from the injection zone into other formations.

Underground oil is usually under pressure. Drilling into the oil reservoir releases the pressure and allows oil to flow into the well where it rises to the surface. Oil recovery under natural pressure conditions is considered "primary" production. Primary production accounts for about 25% of the oil in a reservoir. In fields where it is economically feasible, "secondary" recovery methods are used. This involves pumping water or gas into the reservoir to increase oil production by increasing the pressure in the reservoir. "Tertiary" recovery methods can sometimes increase recovery rates if the viscosity of the oil is lowered so that it flows more easily either by heating the oil or by injecting chemicals into the reservoir. Heating of reservoir oil can be accomplished by injecting steam into the reservoir. Tertiary recovery methods are not yet widely used in this country. By the year 2000, reservoir production from any given oil reservoir is expected to average 40% nationally. Figure 1-25 shows primary, secondary, and tertiary methods of oil recovery. Secondary recovery is currently used in 103 (about 50%) of the oil fields in the three-state study area.

Waterflooding is the method used in about 90% of the three-state area's secondary recovery efforts. Water is injected into the reservoir to increase reservoir pressure and drive additional oil to the surface.

FIGURE 1–25

METHODS OF OIL RECOVERY



Oil is generally found under pressure in porous rock, often in a geological structure such as the one shown here. Drilling a well into the oil-bearing stratum releases the pressure, and in primary production the oil flows to the surface (b) or is pumped out (b). When the natural pressure is too low to bring the oil to the well, secondary recovery may be achieved by pumping water (c) or gas (d) into the field to increase the pressure. In tertiary recovery the oil's viscosity is lowered by injecting steam, which heats it (e), or by injecting a chemical (f).

Source: Scientific American, vol. 238, no. 38, March 1978.

The water supply is usually a brine obtained by drilling in the waterflood area. Fresh water is not desirable for waterflood purposes because it may form chemical bonds with clays in some reservoir rocks and reduce the permeability of the reservoir formation. When fresh water is used, the amount is not large (50 to 10,000 gallons a day) when compared to other uses of fresh water such as agricultural irrigation. About 93 fields in the three-state area are injecting water for secondary recovery purposes.

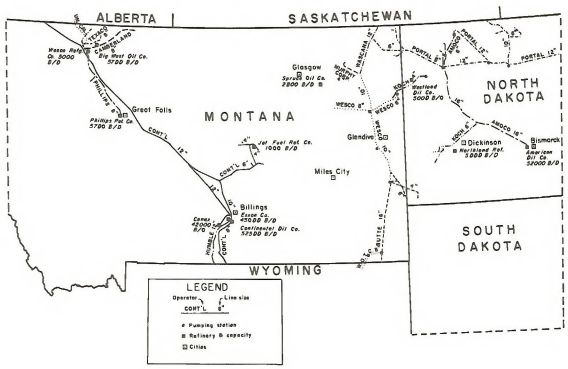
In some cases, formation fracturing is utilized. This is a method of stimulating production by increasing the permeability of the producing formation. Under extremely high hydraulic pressure, a fluid (such as water, oil, alcohol, dilute hydrochloric acid, liquefied petroleum gas or foam) is pumped downward through tubing or drill pipe and forced into the perforations in the casing. The fluid enters the formation and parts or fractures it. Sand grains, aluminum pellets, glass beads or similar materials are carried in suspension by the fluid into the fractures. These are called propping agents or proppants. When the pressure is released at the surface, the fracturing fluid returns to the well, and the fractures partially close on the proppants, leaving channels for oil to flow through them to the well. This process is often called a frac job. In most cases, this procedure requires significantly more land disturbance associated with preparing the drilling area because of the additional tanks and pumps required for the fracturing process.

Pipelines are needed to transport the oil from gathering stations to refineries. Figure 1-26 shows the existing oil pipeline network in Montana and North Dakota. As existing fields increase production or new fields begin production, new pipelines will be needed. These new lines would vary in size from 4 to 16 inches in diameter ranging in length from a few miles to tie into an existing pipeline, or hundreds of miles to supply an oil refinery. Crude oil lines are usually buried. Construction of a pipeline requires excavating and hauling equipment, temporary and permanent roads, pumping stations, clearing the right-of-way of vegetation, and possibly blasting. Figure 1-27 shows a typical pipeline construction spread while Figure 1-28 shows the laying out of pipe along the proposed route.

Pipelines for natural gas also would be needed to transport the gas from gas fields to the market place. Figure 1-29 shows the existing natural gas pipeline system in the three-state area. As with oil pipelines, the diameter and length would vary. Compressor stations may be necessary to increase production pressure to the same level as pipeline pressure and to maintain pipeline pressure. Construction techniques for natural gas lines are similar to those used for oil pipelines.

FIGURE 1-26

MAJOR CRUDE OIL PIPELINE SYSTEM—1976



Source: Western Oil Reporter, July, 1976.

ABANDONMENT

Well plugging requirements vary with the rock formations, subsurface water and the well. Generally, however, the hole is filled with heavy drilling mud to the bottom of the cemented casing. A cement plug is installed at the bottom of the casing, the casing is filled with heavy mud, and a cement cap is installed on top. A pipe is required as a monument, giving location and name of well unless the requirement is waived by GS. If waived, the casing may be cut off and capped below ground level. Protection of aquifers and known oil and gas producing formations may require placement of additional cement plugs.

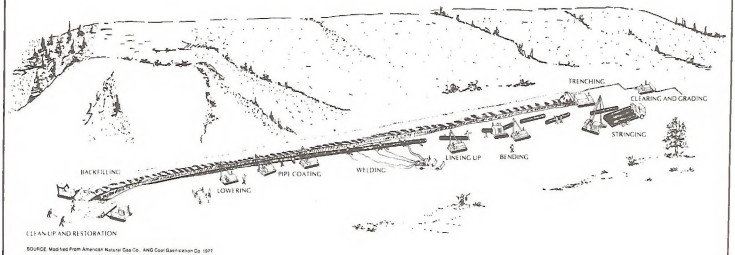
After plugging, the drilling rig is removed and the surface, including the reserve mudpit, is restored to the requirements of the surface management agency. In some cases, wells are plugged as soon as they are depleted. In others, depleted wells are not plugged immediately but are allowed to stand idle for possible later use in a secondary recovery program.

Truck-mounted equipment is used to plug former producing wells. In addition to the measures required for a dry hole, plugging of a depleted producing well requires a cement plug in the perforated section in the producing zone. If the casing is salvaged, a cement plug is put across the casing stub. The cement pumpjack foundations are removed or buried below ground level. When an entire lease is abandoned, the separators, treaters and other processing and handling equipment are removed and the surface restored using topsoil which was stored when the site was leveled. Surface flow and injection lines are removed but buried lines are usually left in place and plugged at intervals as a safety measure.

Appendix 1-1 presents additional information and assumptions pertaining to the physical characteristics of an "average" drilling operation in Montana and the Dakotas.

FIGURE 1–27

TYPICAL PIPELINE CONSTRUCTION PROCEDURES



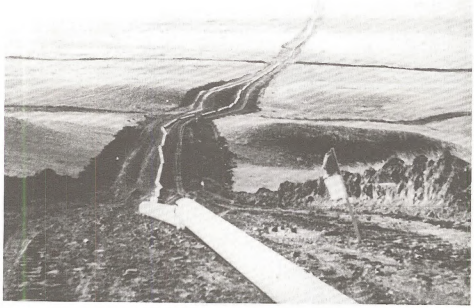
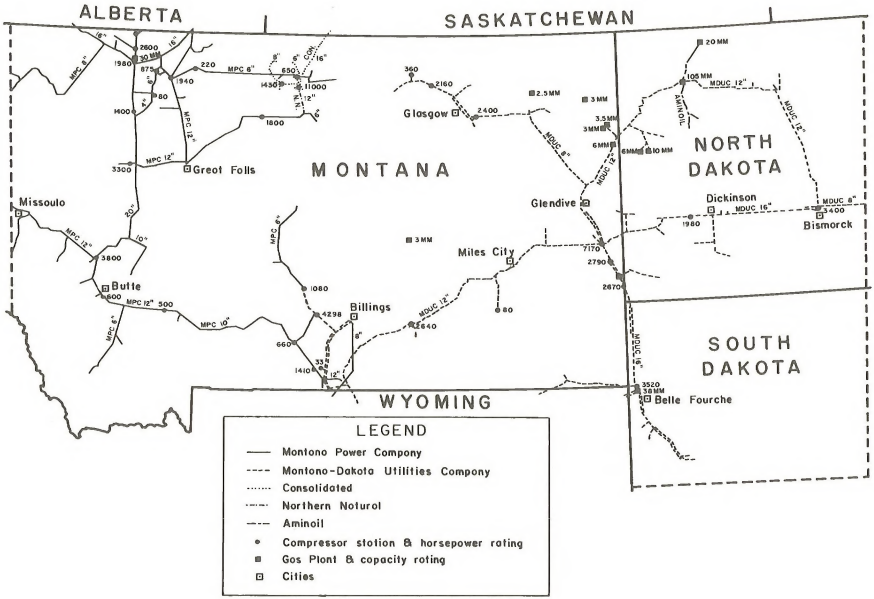


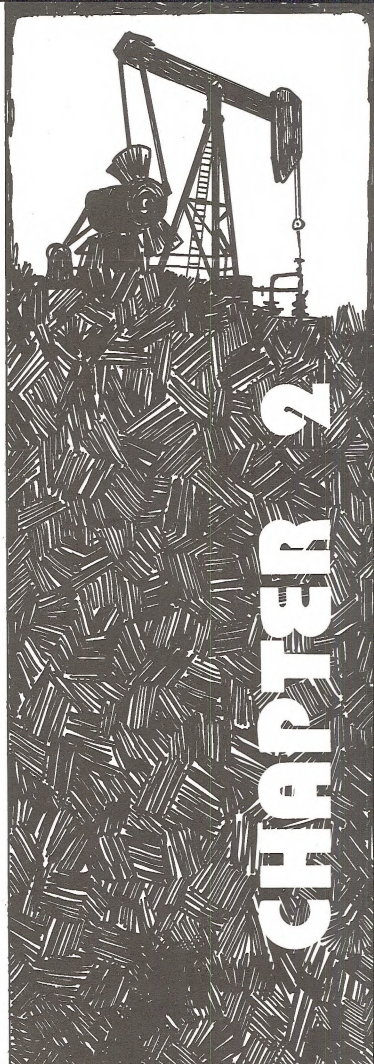
FIGURE 1-28. OIL PIPELINE ROUTE AWAITING ASSEMBLY AND BURIAL.

FIGURE 1–29

MAJOR NATURAL GAS PIPELINE SYSTEM—1976



Source: Western Oil Reporter, February, 1977.



ENVIRONMENTAL CONSEQUENCES

Introduction

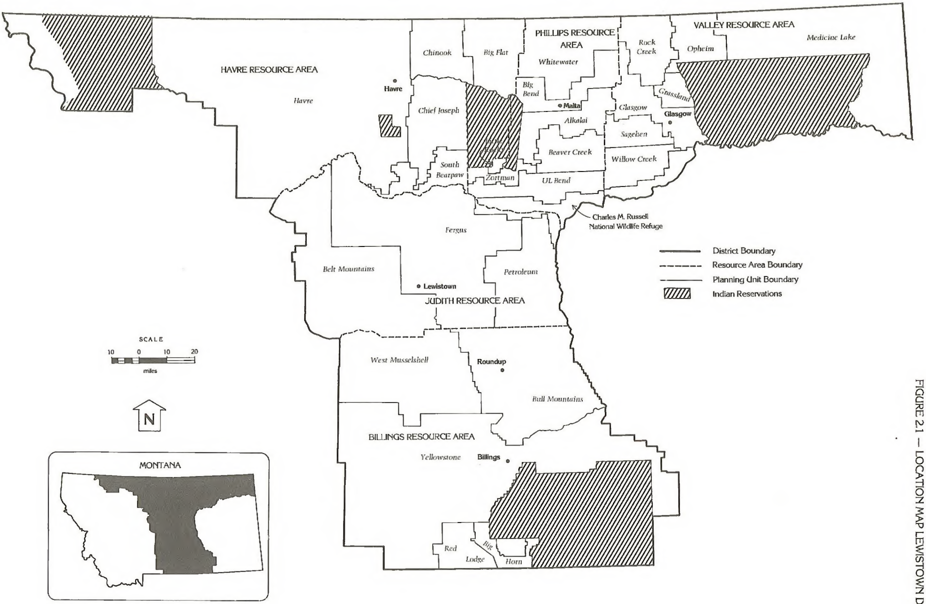
This environmental assessment (EA) studies the potential impacts of oil and natural gas operations on land administered by the Bureau of Land Management in the Lewistown District (Figure 2-1). The district consists of five resource areas (RAs), four of which are separate from the District Office in Lewistown. These detached RA offices are located in Glasgow, Malta, Havre and Billings. The Judith Resource Area Office is included in the district office.

Oil and natural gas produced from Federal lands in the district is roughly comparable to the ratio of land ownership (see Table 2-1). Lands administered by the Federal government producing oil and gas made up 16.4% of the oil and 22.6% of the gas in the district from 18.5% of the land area in the region.

Oil and gas operations have been significant in the past (Table 2-2), producing 9.2 million barrels of oil in the district and 39.6 million mcf (thousand cubic feet) of natural gas in 1977. This was 30% of the oil and 90% of the gas produced in the state, of which total Federal lands produced about 5% of the oil and 20% of the natural gas (Table 2-3). Most of the gas comes from the "Hi-Line" of northern Montana—Glacier, Toole, Liberty, Hill, Blaine and Phillips Counties accounted for more than 75% of the gas production in Montana in 1977.

Oil and gas drilling in the district has been influenced by national trends. Figure 2-2 displays the "wildcat" and development oil and gas drilling in the Lewistown District and Montana. (No breakdown is available on the percentage of these wells on Federal land.) About 80% of the drilling activity in Montana from 1971-77 occurred in this district. Figure 2-3 shows the number of oil or gas wells that were completed and successful, including both development and wildcat drilling.

Figure 2-4 and Table 2-4 show well drilling operations by RAs. This data is for all wells to show the general level of activity in each resource area. Table 2-5 presents average well depth from 1971-77 by RA.



SOURCE: BLM 1981

FIGURE 2.1 — LOCATION MAP LEWISTOWN DISTRICT

FIGURE 2.2. TOTAL WELLS IN THE LEWISTOWN DISTRICT AND MONTANA DRILLED FROM 1971-1977.

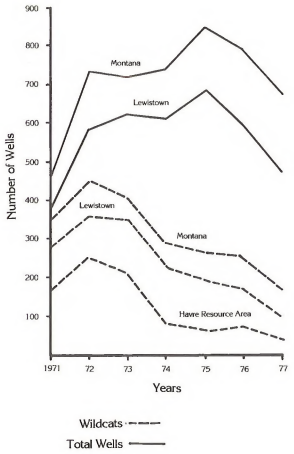


FIGURE 2.3. SUCCESSFUL WELLS IN THE LEWISTOWN DISTRICT AND THE STATE OF MONTANA DRILLED FROM 1971 - 1977.

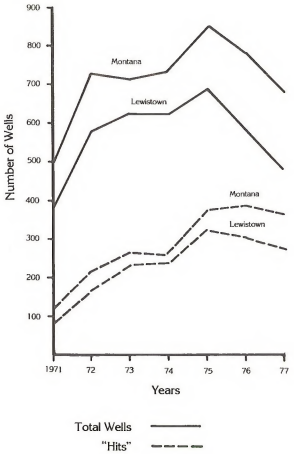


FIGURE 2.4. SUMMARY OF THE WELLS IN THE LEWISTOWN DISTRICT BY RESOURCE AREA DRILLED FROM 1971-1977.

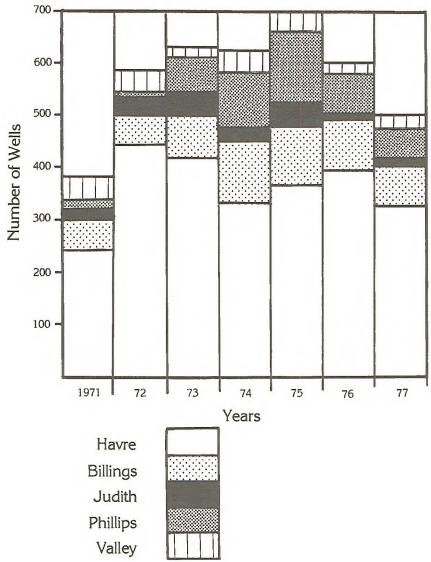


TABLE 2.1: FEDERAL OIL AND GAS ACREAGE BY AGENCY AND BLM RESOURCE AREA IN THE LEWISTOWN DISTRICT

	Agency					
Resource Area	BLM (Public)	BLM (Acquired)	(Fee)	USFS (**)	Other Fed* (**)	Total Fed* (**)
Billings	247,718	132,712	261,441	867,705	54,729	1,563,305
Phillips	726,950	334,053	426,326	—	73,666	1,560,995
Valley	735,169	362,702	197,334	—	20,496	1,315,701
Judith	466,549	236,166	188,326	423,161	20,172	1,334,374
Havre	365,818	174,928	480,560	28,274	88,977	1,138,557
TOTAL	2,542,204	1,240,561	1,553,987	1,319,140	257,040	6,912,932

Agency	Acres	% of District
Total BLM Administration	5,336,752	14.3%
Total Other Federal Agencies	1,576,180	4.2%
Total Federal Oil & Gas (Excluding CMR Wildlife Refuge)	6,912,932	18.5%
Total Private, State, Indian, and CMR Wildlife Refuge	30,360,668	81.5%
Total Area, Lewistown District	37,273,600	100.0%
Total Area, Montana	93,004,160 Acres	

Sources: Mineral Inventory, Branch of Records, Montana State Office, 1978 Socio-Economic Profile, Montana, 1974.

* Excludes C.M. Russell Wildlife Refuge
** Public, Acquired, and Fee surface combined.

TABLE 2.2: OIL AND GAS PRODUCTION IN THE LEWISTOWN DISTRICT

Year	Lewistown Gas (MCF)	MT Gas MCF	%	Lewistown Oil (B)	State Oil (B)	%
1972	18,709,773	31,539,029	59%	13,488,329	34,571,587	39%
1973	44,390,402	55,276,037	80%	11,635,897	34,583,851	34%
1974	36,284,413	40,933,838	89%	11,137,785	34,356,869	32%
1975	36,988,491	41,664,224	89%	10,290,140	32,814,669	31%
1976	37,749,375	42,987,936	88%	9,576,336	31,658,373	30%
1977	39,556,484	44,326,295	90%	9,191,712	31,695,673	30%
				15% Federal		

(MCF = 1,000 cf)
(B = Barrels)

TABLE 2-3: FEDERAL OIL AND GAS PRODUCTION IN THE LEWISTOWN DISTRICT IN 1977

	Oil (BBL)	Gas (MCF)
BLM, Lewistown District	1,508,325	8,930,609
Lewistown District, all sources	9,191,712	39,556,484
BLM, Montana	6,950,342	11,279,624
Montana, all sources	30,695,673	44,326,295

(MCF = 1,000 Cubic Feet)
(BBL = Barrels)

Source: Board of Oil and Gas Commissions Annual Review, 1977.

TABLE 2.4: SUMMARY OF DRILLING IN THE LEWISTOWN DISTRICT BY RESOURCE AREA

	Number of Wells Drilled					
Year	Havre	Billings	Judith	Phillips	Valley	Total
1971	247	54	10	17	45	373
1972	446	61	27	9	43	586
1973	414	83	44	71	17	629
1974	343	112	20	114	34	623
1975	365	108	38	136	42	689
1976	387	90	3	80	39	599
1977	327	69	10	63	25	494

TABLE 2.5: DRILLING DEPTH BY RESOURCE AREA

Year	Havre	Billings	Judith (In Feet)	Philips	Valley	District
1971	2166	4660	2879	2459	6395	3070
1972	2008	4202	1984	2040	8081	2682
1973	1954	3197	2553	1704	5594	2230
1974	2105	3514	2403	1626	6014	2494
1975	2019	3309	2412	1517	6654	2426
1976	2275	4212	2938	1696	8027	2866
1977	2232	3920	2652	1820	8263	2729

It is difficult to predict drilling activities in the future but this EA assumes that every oil and gas lease issued by BLM has the potential for development and production. Based on oil and gas operations in the past seven years, these conclusions can be drawn:

1. Wildcat drilling in the Lewistown District has declined since 1972. (See Figure 2-2).

2. Most oil and gas activity (both for exploration and development drilling) occurs in the six counties in the Havre Resource Area. Most of these operations have been developing shallow natural gas fields like the Leroy, Tiger Ridge Fields in the Havre RA, the Whitewater area in the Phillips RA and the Bowdoin Dome in the Valley RA.

3. The annual number of wells drilled in Montana and the Lewistown District peaked in 1975,declined through 1977, and is currently rising rapidly.

4. Most of the oil and gas operations in the state from 1971-77 were in the Lewistown District. The Williston Basin development (the Mon-Dak Field) in eastern Montana and the operations in the Overthrust area in the western part of the state will probably mean a decrease in drilling will occur in this district as exploration capital is concentrated in the other areas. Development drilling in the Havre RA is the exception to this trend.

5. Well drilling depth has not changed substantially over the past six years (see Table 2-5) because the large number of shallow wells in north Montana has caused the average well depth to be low. Well-depth averages for the Valley RA have fluctuated, a reflection of the more operations in the Bowdoin field in Valley County (where there are shallow natural gas wells) and in the Williston Basin area in Roosevelt and Sheridan Counties (deep oil wells). This fluctuation is not due to changes in drilling but rather to the different types of petroleum operations in the two different fields.

6. Figure 2-3 seems to show at first glance that the success ratio for oil and gas drilling has risen substantially. A closer look at the data, however, shows that the increased success is because of the trade-off between development and exploratory drilling. The success ratio over the past seven years has been 8.8% for exploratory drilling (147 successes of 1,664 wells) and 64% (1,480 of 2,775) for development drilling.

At the present time most of the Federal lands in the Lewistown District are leased. Most of the leases processed are expiring ten year leases that have never been in production. An average of 70 leases per month are processed. Table 2-6 details the number of leases by quarter from July 1977 to October 1978.

The impacts from continued oil and gas leasing on public lands are summarized in Section 2.1 following.

TABLE 2-6: LEASES PROCESSED BY THE LEWISTOWN DISTRICT

From: To:	July- September 1977	October- December 1977	January- March 1978	April- June 1978	July- September 1978	October- December 1978
No. of Leases:	384	140	212	178	162	130 (estimated)

Source: Public Land Statistics, 1965-76.

2.1 Impact Summary

CLIMATE AND AIR QUALITY

Impacts to air quality from oil and gas operations would mostly be caused by dust and other emissions from vehicles. There would be no impacts to the macroclimate in the district.

GEOLOGY AND TOPOGRAPHY

Earthmoving operations and the use of explosives near unique geologic features would affect them as would production facilities located nearby. No significant impacts on topography would be expected to occur.

SOILS

Impacts to soils in the district would be caused by erosion from surface disturbances, compaction by traffic and the possible loss of vegetation from oil and drilling fluid spills.

VEGETATION

The direct destruction of plant cover during oil and gas operations would affect vegetation, depending upon the topography and soils of the area as well as the vegetation present.

WATER

Impacts to the water resources of the district would include increased erosion and sediment yields, contamination of groundwater resources and possible contamination and degradation of the aquatic and near-stream environment by spilling fluids during oil and gas operations.

ANIMALS

Road and pad construction, causing forage and habitat losses, and the presence of more humans during oil and gas operations would affect animals. Intrusion into critical winter ranges or breeding areas when in use could have serious effects on certain species.

RECREATION

Anticipated impacts from oil and gas operations on recreation would be minimal and directly related to the effects of oil and gas activities on hunting, fishing or the general enjoyment of the outdoors by the public.

AESTHETICS

Road building and pipeline construction would be the principal agents causing long-term impacts, especially on areas difficult to reclaim.

WILDERNESS

Major impacts to wilderness values would be the loss of solitude and changes in the natural appearance of the landscape from oil and gas operations.

PREHISTORIC AND HISTORIC FEATURES

Cultural sites could be affected by the loss of the opportunity to examine artifacts in their true relationship with one another and the destruction of features, particularly in areas where there are high concentrations of sites.

ECONOMIC AND SOCIAL CONDITIONS

Economic and social impacts from oil and gas operations would center around the capacities of small communities in the district to absorb the influx of oil and gas workers, i.e. providing housing and basic services.

LAND USE

Land use impacts would involve conflicting land uses near communities which would expand as a result of oil and gas activities, thereby experiencing reductions in forage and agricultural production.

2.2 Environmental Impact Assessment

This section analyzes the environmental impacts that would result from leasing Federal oil and natural gas resources in the Lewistown District. These impacts are arranged either by the stages of oil and gas operations outlined in Chapter 1—preliminary exploration, exploratory drilling, development, production and abandonment—or by other categories, whichever better fits the discussion at hand.

The study is supplemented by the Lewistown District Oil and Gas Overlay File, a ½ inch-to-the-mile mapping system providing detailed, specific environmental sensitivity ratings. Such resources as soils, vegetation, topography, animals, water, recreation, aesthetics, wilderness and prehistoric and historic features have overlays to demonstrate specific areas sensitive to that resource in the district. The originals of these overlays are on file in the respective RAs in the Lewistown District. Examples of these overlays accompany some of the resources discussions to follow.

CLIMATE AND AIR QUALITY

The macroclimate of any part of the Lewistown District would not be affected by oil and gas operations. During any stage of oil and gas development, however, the construction and continuous use of access roads and drill pads would affect the microclimate in the immediate area of surface disturbances. Vegetation removal drastically raises maximum soil surface temperatures and permits greater localized wind velocities and evaporation rates, generally to the detriment of microorganisms in the soil. In addition, evaporation from pits increases the humidity in a locale.

Air quality would be slightly affected locally by all stages of oil and gas development, including exploration, development, production and abandonment. Dust created during road and drilling pad construction increases particulate concentrations in the air. This problem would be worst during dry and windy weather, aggravated by the semi-arid climate and high winds that occurs through most of the district. Greater particulate concentrations from surface disturbances would be relatively minor when compared to the increases from the continued use of roads by oil and gas maintenance personnel, landowners and lessees, and the general public for recreation purposes. Emissions from internal combustion engines would also contribute to particulate loading.

Dust from traffic and smoke and other emissions from vehicles and stationary engines used in the drilling operations would be the primary air pollutants during development of oil and gas wells. During the production stage, pollutants such as carbon monoxide, hydrocarbons, nitrogen oxides, sulphur oxides and hydrogen sulfide would be produced in separation facilities, during disposal of liquid water and unwanted gas, by the burning of waste petroleum products, by the emission of objectionable odors and by the venting of noxious vapors from storage tanks. Serious local air pollution could occur during production if system failure resulted in accidental explosions, fire, blowouts, oil spills or leaks.

Direct air contamination from oil and gas operations would cease on abandonment, but the continued use of roads and trails by the public could produce some dust in the immediate area for years to come.

GEOLOGY AND TOPOGRAPHY

General

All stages of oil and gas development could alter or destroy geological features so that their human interest would be impaired. The indiscriminate use of explosives near delicate geological features, such as caves and arches, for instance, could affect their interpretive value. Earthmoving operations could also destroy these features and the location of oil and gas production facilities near interesting geological features would distract from their value for viewing and interpretive purposes.

Geological Subsidence

Geological subsidence could occur during the production stage of oil and gas development. Subsidence occurs when the removal of fluids and gases in an enclosed space leaves unfilled spaces, resulting in the compaction of the rock. The effects on the surface of this compaction, equal to the amount of compaction of the compressed layer, is called subsidence. In areas where natural gas is dissolved in subsurface groundwater, the withdrawal of the water causes subsidence. U. S. Geological Survey studies show subsidence begins within a few minutes after the first withdrawal of subsurface fluids.

Significant subsidence from fluid withdrawal normally occurs in unconsolidated sediments, and, although it can also occur in consolidated rock, it is insignificant.

Seismicity

There is little historic evidence to show that injection or withdrawal of fluids during oil and gas drilling and production causes earthquakes. Subsidence is known to have been caused by the withdrawal of oil and gas, but subsidence can also occur naturally, causing settlement in unconsolidated sedimentary rocks or offsetting zones of weakness in surface rocks.

Micro-seismicity might occur in reservoirs through readjustment but this would be insignificant.

Minerals

Wells and well facilities, storage tanks, tank batteries, compressor plants and operation buildings might deter the development of specific minerals in certain locales during the production life of the field.

Topography

Few oil and gas operations would affect the topography of the area. However minor the effects on topography would be, the impacts to soils (and hence vegetation) associated with the topography might be more serious. Therefore, the sensitivity overlay showing topographic features is a composite of topography, soils and vegetation, with topography forming the base (Figure 2-5). This figure is intended to give the reader a general notion of the topography of the district, using north Phillips County as an example.

Topographic impacts would occur mainly during the development stage and would be primarily visual in nature. Drilling pads, roads, pipelines and other construction activities would disturb the natural landscape to some extent, depending upon the location. There is a chance that pipeline operations on steep, unstable soils (such as the river breaks areas) would result in substantial landslides or soil slumps.

SOILS

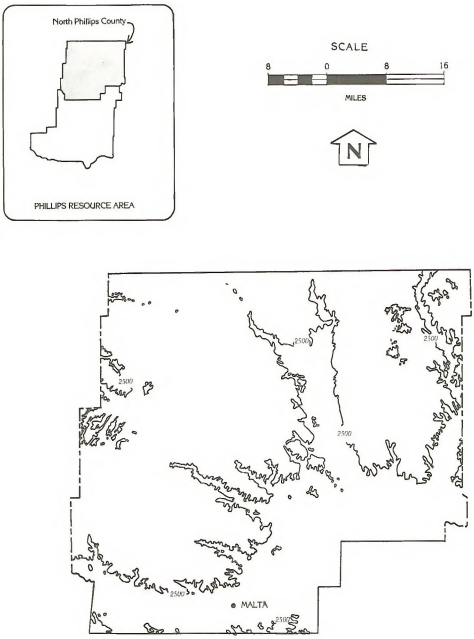
Soils are usually affected by oil and gas operations in two ways—surface disturbances and soil compaction. A third kind of impact, the spilling of fluids on the soil, can also occur. Figure 2-6 gives an example of sensitive soil and vegetation areas in the district, using north Phillips County for this purpose. It should be noted that the reclaimability of soils and vegetation are greatly dependent on topography, i.e. the steepness of slopes. For this reason, the soils sensitivity overlay above was built over a topographic base, shown in Figure 2-5.

Surface Disturbances

Soils disturbed by building drill pads, access roads and pipelines would be prone to accelerated erosion because of the removal of protective vegetation and litter cover. Protective cover binds the soil, provides desirable surface texture for infiltration of water and air and protects the surface from compaction by raindrops. Wind and water erosion on bare soil surfaces would cause more sediment off-site, creating additional soil cover damage and further increasing erosion. The total effect on erosion would be significant where surface disturbances occurred on slopes greater than 30%, in areas of fragile or unproductive soils (such as those in river breaks) and in the area near Belfry in the southern part of the district.

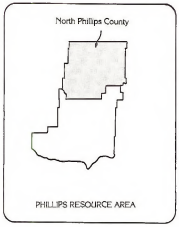
Soil losses would be more severe if the topsoil were not stockpiled during construction for later use. Impacts would be greatest on shallow, heavy, clay soils of low productivity in the river breaks, and least on the deep, fertile, highly productive soils of the mountain meadows.

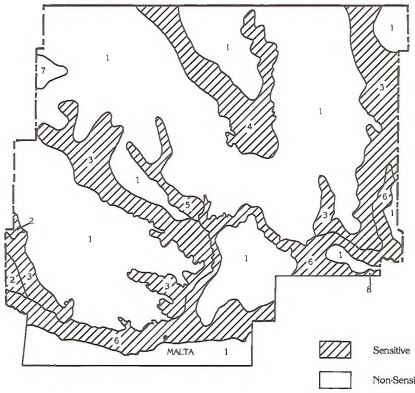
FIGURE 2.5 . TOPOGRAPHIC FEATURES IN NORTH PHILLIPS COUNTY
(PHILLIPS RESOURCE AREA)



SOURCE: BLM 1981

FIGURE 2.6 . SOILS & VEGETATION SENSITIVITY OVERLAY IN THE PHILLIPS RESOURCE AREA (NORTH PHILLIPS COUNTY)





NOTE: See following page for description of soil subgroups and related vegetation.

SOURCE: BLM 1981

Loamy glacial till soils on uplands. Series: Bearpaw, Dooley,Hillon, Joplin, Kevin, Phillips, Scobey, Sunburst, Telstad, Vida, Williams, Zahill, and Zahl. These series are in a sandy, silty, thin silty, or thin clayey range site.

Grassland type (short and midgrasses); western and thickspike wheatgrass.

Dominantly claypan soils on glacial till uplands. Series: Elloam, Tealette, and Thoeny. These series are in a claypan or dense clay range site.

Grassland-sagebrush type (short and midgrasses); western and thickspike wheatgrasses, blue grama, clubmoss, fringed sagewort, cactus, big sagebrush.

Acid shale upland soils. Series: Dilts, Julin, and Teigen. These series are in a clayey or coarse clay range site.

Grassland-sagebrush-juniper type (midgrasses predominate); prairie sandreed, little bluestem, western and thickspike wheatgrasses, American vetch, creeping, common, and Rocky Mountain juniper, big sagebrush.

Calcareous or bentonitic shale upland soils. Series: Abor, Barkof, Bascovy, Dimyaw, Lisam, Neldore, Norbert, Thebo, Weingart, and Yawdim. These series are in a clayey, shallow clay, shallow, or claypan range site.

Grassland-sagebrush type (midgrasses predominate); western and thickspike wheatgrasses, green needlegrass, scarlet globemallow, winterfat, nuttall saltbush, big sagebrush, creeping juniper, rose spp.

Loamy sedimentary upland soils. Series: Cabba, Cabbart, Cambert, Dast, Delpoint, Doney, Ernem, Lonna, Marmarth, Reeder, Rentsac, Riedel, and Twilight. These series are in a sandy, silty, or shallow range site.

Grassland type (short and midgrasses); western and thickspike wheatgrasses, bluebunch wheatgrass, blue grama, cactus, fringed sagewort.

Loamy and clayey alluvial soils on floodplains and low terraces. Series: Bowdoin, Gesa, Glendive, Hanly, Harlem, Havre, Havrelon, Kiwanis, Korchea, Korent, Lallie, Lardell, Lohler, Nesda, Rivra, Trembels and the Typic Fluvaquents, Typic Ustifluvents, Aquic Ustifluvents, Fluvaquentic Haploborolls, and Ustic Torrifluvents. These soil series are dominantly in an overflow range site. Small areas are in a saline lowland, sandy, silty, or clayey range site.

Grassland and grazable woodland type; western wheatgrass, green needlegrass, blue grama, silver sagebrush, rose spp., snowberry, willow, cottonwood.

Moderately coarse and coarse textured soils on terraces, fans, and footslopes. Series: Assinniboine, Blanchard, Busby, Chinook, Cozberg, Hawksell, Lihen, Parshall, Tally, and Yetull. These series are in a sands or sandy range site.

Grassland type (midgrasses predominate); prairie sandreed, little bluestem, plains muhly, green sagewort, yucca.

Very slowly permeable clay alluvial soils on terraces and fans. Series: Vaeda and Vanda. These series are in a dense clay range site.

Grassland-sagebrush type; western and thickspike wheatgrasses, green needlegrass, nuttall saltbush, sandberg bluegrass, foxtail barley, big sagebrush, cactus.

Compaction

The weight of trucks or other heavy equipment on the ground surface compacts the soil, causing spaces within the soil profile to collapse. The soil is rendered more dense, less porous and less permeable. Compaction often severely reduces the infiltration capacity of the soil, leading to increased surface runoff and the possibility of accelerated gully and channel erosion. Compaction may also limit vegetation production to the point of sterility.

The effects of compaction would vary with soil type, climate and the degree of the compacting potential. Effects would be most severe when soils are wet or drying. This occurs frequently during the spring and early summer months and occasionally during the fall.

Compaction would also be affected by how often trucks or other heavy equipment passed over the surface. Impacts would be significant where access trails were used continuously, particularly during wet periods. Seismic surveys would cause significant effects when their heavy vehicles passed along survey lines during wet periods.

Fluid Spills

A third kind of impact on soils could be caused by oil spills or the discharge of salt-enriched water from wells and treaters. These fluids might affect the soil severely in a relatively localized area. Toxic and saline concentrations from the fluids would often be capable of sterilizing the soil.

VEGETATION

As explained in the "Topography" Section, the kinds of vegetation on a given area, their sensitivity to soil disturbances and their reclaimability afterwards are greatly dependent on that area's topography and soils. Therefore, the sensitivity overlay for vegetation was combined with the one for soils on a base which delineates topography (Figure 2-6).

Sensitive vegetation areas are often so small that they are unknown or cannot be shown on an overlay. These areas will be evaluated by BLM personnel during the Application for Permit to Drill (APD) on-the-ground inspection. Appropriate stipulations will be developed at that time.

Known sensitive vegetation areas include: mountain ranges with steep, often shaley slopes and evergreen cover; large areas of fragile soil subgroups; and large areas along major drainages (including the Missouri and Yellowstone Rivers), possessing riparian vegetation, and the "breaks" ecosystems next to the drainages containing shrubs and evergreens.

The greatest threat to terrestrial plants from oil and gas operations would come from direct destruction caused by construction of seismograph trails, drainage crossings, drill pads, roads, pipelines and other facilities. Impacts to aquatic vegetation that could occur include the siltation of streams from surface disturbances, increased water temperatures from treater facilities, contamination of water by oil spills and the release of chemicals into surface drainages.

Impacts to vegetation are specified below by stages of oil and gas development.

Preliminary Exploration

Preliminary exploration would have moderate impacts on vegetation. This stage involves building seismograph trails and drainage crossings which, depending upon terrain and present trails, might require bulldozer work. Destruction or disturbance of vegetation would be caused by the crushing of forbs and grasses and breaking or uprooting shrubs or trees. Vegetation losses from soil erosion, soil compaction and siltation caused by truck-mounted equipment has not been quantified. Using a water drilling system could lead to the spillage and improper disposal of drilling mud which could destroy vegetation. Dust along roads, trails and around drill sites (if pneumatic drills were used) could reduce the air quality in a locale, thereby reducing the growth rates of vegetation. Explosions or accidental fires could cause the destruction of vegetation and increased soil erosion also.

Exploratory Drilling

Exploratory drilling would have a high impact on vegetation. Temporary roads and drilling pads require the complete removal of vegetation. On sensitive vegetation types, design and location of construction would be extremely important to minimize the destruction of high-value vegetation. The effects of vegetation removal on other parts of the environment could be serious, depending upon the area and the parts affected. Other possible impacts would include the spilling of toxic materials used in drilling or leakage of toxic fumes (primarily hydrogen sulfide) during the drilling process. The loss or disposal of toxic substances around the perimeters of drill pads could damage vegetation. The same problems could occur, to a much greater extent, when pits or reservoirs fail because of faulty design or construction.

Development

Development of oil and gas wells into active fields would also have a high impact on vegetation. A minimum of one permanent road to serve the field would be needed with one access road to each well. This usually would involve widening and upgrading temporary roads for all-weather use.

Drill pads would not be completely rehabilitated in the short-run if the well were successful. Instead, storage tanks, separators, pumping equipment and a power source might be required on the drilling site. Often the perimeter of the drilling site (which is not required for the continued operation of the well) could be restored as nearly as practical to its original condition.

The construction of buried pipelines for transporting oil or natural gas to distribution points or initial treater facilities would also cause the destruction of some vegetation. A line would be cleared along a right-of-way for installation of the pipeline and its maintenance after construction. Reseeding along rights-of-way is not always successful, especially with the more sensitive soil and vegetative types. Success often depends on precipitation. The disturbed area along the right-of-way might be of low productivity or produce undesirable vegetation. Pipeline construction requires specialized equipment and manpower, necessitating even more travel in the area than other oil and gas operations. This extra travel would further affect the local air quality from dust and thereby affect vegetation productivity also. Other impacts from the construction and operation of buried pipelines would be from the leakage of toxic substances and oil from the pipelines and the disposal of waste materials. Fire would be a hazard here, too.

Production

Oil and gas production would have a moderate impact upon vegetation since the major surface disturbances would have already occurred during the development stage. Continuing maintenance could affect rehabilitated areas adversely, causing renewed damage. The flaring of hydrogen sulfide could also damage some vegetation but there is no documented evidence of this. Impacts would be minimal in most cases. Production water could contain saline concentrations higher than the natural waters and could, over a long period, cause the loss of desirable vegetation because of salt concentrations in the soil.

Abandonment

The abandonment and rehabilitation of oil and gas fields would also have moderate impacts on vegetation, too. Facilities could be removed and most of the area revegetated by using the stockpiled topsoil and reseeding. Roads, pads or platforms would sometimes be left, depending upon the type of fill material used. Recreational needs might preclude the total rehabilitation of access roads into certain areas.

WATER

The major effects on water resources from oil and gas operations would be from greater erosion and sediment yields, groundwater contamination and fluid discharge and spills. In this section the first two are considered by the effects that they would have on the surface water and groundwater resources. The last is treated as a separate category.

Surface Water

Oil and gas operations involving surface disturbance and soil compaction might cause accelerated soil erosion and sedimentation. Increases in the turbidity of water, therefore, could result from any stage of oil and gas development. An example of sensitive drainages is shown in Figure 2-7, using the Fergus Planning Unit of the Judith Resource Area.

During the exploration stage, seismic and drilling operations require the construction of access trails and platforms. If seismic exploration trails crossed stream channels, problems could result from disturbances of unstable streambanks. Once scraped bare, these would be difficult to revegetate. Bank cutting could begin, and the site could become a source of sediment loading in the stream, adversely affecting downstream uses. The degree of impact would depend on the severity of the streambank disturbance, the size of the stream and potential off-site uses of the water.

Roads, excavated drilling platforms and mud pits are developed during exploratory drilling. If these should occur on sloping terrain or near streams, significant increases in erosion and turbidity might result. Accelerated erosion and sediment yields would be greatest on cut banks and fill slopes created during construction. The passage of heavy equipment over road and platform surfaces would compact the soil, resulting in less water infiltration and, therefore, in increased runoff. Inadequate drainage controls would allow storm runoff to erode gullies in the cut and fill slopes. These impacts would depend on the number of roads and drilling platforms, their proximity to a body of water and the potential uses of the water downstream.

Building permanent access roads, pipelines, treater and tank battery facilities might result in increased erosion and sedimentation during the production stage. In periods of high runoff, water quality might be adversely affected by well-site contaminants on the soil surface during this stage. The severity of the impacts would be proportional to the number of installations in an area and their proximity to streams and to the downstream water uses.

Groundwater

Pollution hazards to groundwater from oil and gas operations would be presented by inadequate well casings, abandoned wells with improper plugging or the seepage from brine and mud pits.

Water quality in groundwater formations varies. At certain depths, freshwater aquifers would be penetrated by oil and gas drilling. This would allow briny water in formations located above or below the fresh water to mix with it if not properly sealed off during the construction and development of the well.

Regulations have been established for preventing interformational movement and contamination of groundwater during and after well development. Drillers are required to cement aquifer and porosity zones on the casing. Where cementing is improperly completed or where the casing breaks, the transfer of liquids between formations might constitute a significant adverse impact on groundwater quality. If leaks should occur, however, steps would be taken by the companies to correct the problem. Because of this, groundwater contamination from operating oil or natural gas wells should be minor.

FIGURE 2.7 . SENSITIVE WATERWAYS WITHIN THE JUDITH RESOURCE AREA. (FERGUS PLANNING UNIT)

Lessee/operator may be controlled or limited as to his surface use within sensitive waterways. These sensitive areas are described as within 500 feet, or when necessary, within the 25-year flood plain from reservoirs, lakes, and ponds and intermittent, ephemeral or small perennial streams; 1,000 feet, or when necessary, within the 100-year flood plain from larger perennial streams, rivers, and domestic water supplies.

SOURCE: BLM 1981

Abandoned wells that are improperly plugged and badly corroded would constitute a greater hazard to groundwater contamination than leaky casings. In addition to allowing interformational transfer of water, these wells have been known to function as conduits for the upward movement of reinjected salt water in producing oil fields (Hopkins, 1963).

Seepage from oil field brine pits could cause shallow groundwater contamination (Rold, 1971). Leaks from improperly lined brine pits might allow the penetration of treater water into sediments below the pond. Groundwater would be affected after the brine infiltrated deep enough to intersect the water table.

Possible adverse impacts on shallow groundwater aquifers might also come from the drilling of seismic shot holes. Effects could include groundwater contamination and minor structural changes, affecting aquifer permeability. This would result from separated aquifers and/or the flow of surface water down unplugged holes. A study of the influence of seismic shot holes on groundwater in Montana indicates that seismic activity has probably not produced significant structural changes in aquifers (Bond, 1975). The study also points out that seismic programs have probably not resulted in significant amounts of interflow between aquifers since observed shot holes tended to plug themselves. Water quality samples from shot holes showed slight temporary increases in dissolved chemical constituents immediately after seismic operations. These increases were not great enough to affect the uses of the water, though.

At one site, the seismic hole remained open for nearly a year. Montana law requires exploration companies to plug all shot holes, but there is no definition of a proper plug.

Mud pit fluids are also a hazard to groundwater quality. These are generally poor in quality, containing as they do high concentrations of dissolved solids. Department of Health and Environmental Sciences (DHES) regulations prohibit the disposal of these fluids into drainages. The pits are normally fenced and the fluids allowed to evaporate or infiltrate into the soil over a period of time. Adverse impacts to groundwater might occur if the mudpit fluid penetrates deep enough to intersect the water table. This would be likely only in areas where the water table is near the surface.

There have reportedly been very few groundwater problems associated with oil and gas development in the Lewistown District (Water Quality Bureau, 1978).

Discharge Water and Oil Spills

Most water produced from oil and gas formations varies from brackish to highly saline. Disposal is normally made through brine evaporation pits. Fresh discharge waters can be used for livestock watering and other uses, however.

Discharge of formation and treater water outside a brine pit requires a disposal permit from DHES, to ensure that discharged fluids meet certain water quality standards. Since petroleum might not be completely separated from the treater water, oil skimmer pits are constructed and the oil removed before the fluids are discharged.

Adverse impacts to water quality might be significant if oil skimmers or brine pits were allowed to overflow and run into nearby drainages. Such spills are uncommon but it should be noted that controls are not stringent. Potential impacts would be greatly reduced by prohibiting oil and gas development near water.

Oil spills generally occur when petroleum is in transit, although spills may also occur from blowouts during well drilling and development. All oil spills entering water bodies are reported to the Environmental Protection Agency, BLM and DHES, who are responsible for investigating the causes. The frequency of spills in the Lewistown District is unknown, though few have been reported in recent years. Oil entering a body of water would have a significant, long-lasting, adverse effect. Water might be rendered unsuitable for agricultural, domestic and industrial uses, and impacts to aquatic and riparian wildlife habitats might be severe. The potential for degrading water quality would increase if oil and gas operations were allowed near perennial streams, lakes and reservoirs.

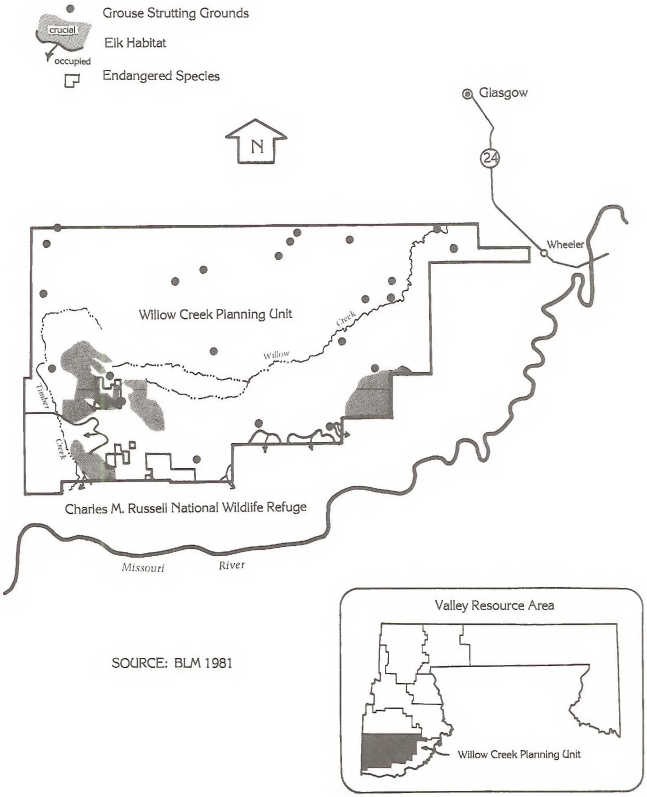
ANIMALS

All stages of oil and gas operations directly affect fish and wildlife. Destruction of terrestrial habitat by grading, clearing, burying or overturning would cause the death of small mammals, reptiles, amphibians, invertebrates and young birds. Adding toxic substances to or taking the water from aquatic habitats would kill fish, aquatic invertebrates and amphibians. The killing of animals whose home ranges overlapped roads would increase and building new roads could also contribute to more illegal shooting of raptors and the poaching of game species. The construction of powerlines to facilitate the development of oil and gas could cause a hazard to large raptors, possibly leading to their electrocution.

Animals would also be affected indirectly as habitats were destroyed or altered from their natural state. The population loss would be in direct proportion to the size of the area disturbed and the importance of that particular habitat in the life cycle of the affected species, as well as the length of time the habitat remained unrestored.

Human intrusion during any stage of oil and gas development would expose wildlife to severe—even intolerable—disturbances. Animals might abandon areas rendered intolerable to them. If there were no suitable habitat in nearby areas or if this habitat were already occupied to its carrying capacity, displaced animals might be lost. This would be especially true if the disturbances were persistent.

FIGURE 2.8 WILDLIFE SENSITIVITY OVERLAY FOR WILLOW CREEK PLANNING UNIT, VALLEY RESOURCE AREA



SOURCE: BLM 1981

Oil and gas development would affect different types of animals in varying degrees. The probable impacts to each type of animal are given below.

Big Game

Big game animals could be killed or injured from building and the continuous use of new roads and from industry accidents. Vehicle-animal collisions, as well as the poaching of big game, could increase. Poisoning by contaminated water or vegetation could kill big game if accidental blowouts, spills or leaks of poison gas, oil or caustic water should occur. Losses of this nature should be insignificant, however, unless an accident were to occur.

Building roads or facilities into critical big game habitat could cause human disturbances in vital areas at a crucial time in the life cycle of big game species. This could lead to losses more severe than those from direct mortality and could even result in the loss of a local population. Crucial fawning and calving grounds and winter ranges might be avoided by game if the human disturbances became intolerable. Migration routes could also be blocked and traditional patterns changed.

During certain seasons, persistent disturbances of riparian areas and other cover in prairie habitats might lead to lower population levels since these areas can be vital to big game. Fewer animals would mean less hunting success. On the other hand, new roads into previously inaccessible big game habitat could be beneficial if the populations were at high levels and underharvesting has been a problem in the area. This is usually not the case, unfortunately, and new roads are difficult to block once people become accustomed to using them. Thus, the detrimental impacts from additional roads might be persistent and long-term.

Since the locations of future oil and gas operations are currently unknown and because of the incomplete knowledge of critical big game habitat in the Lewistown District, it is not possible to quantify the big game losses that would occur from oil and natural gas development.

Game Birds

Minor casualties would occur to game birds from oil and gas operations. During the exploration stage, off-road vehicles, exploration rigs and construction equipment could destroy nests and kill young birds. Some incubating nests might be abandoned. Road kills and poaching could be expected to increase with new roads into previously undisturbed habitat. Accidents that allow toxic substances to escape into important game bird watering areas could also cause casualties.

Greater impacts would occur from the destruction and alteration of habitat during development and production than from any other stage of oil and gas operations. Sage and sharp-tailed grouse would be affected the most. Their habits throughout the year, including nesting, brood rearing and wintering, are usually tied to a specific breeding area. Any development near grouse breeding grounds could cause significant detrimental effects, perhaps even causing the total, long-term loss of a local grouse population. Representative densities of grouse grounds are shown on the sensitivity map for the Willow Creek Planning Unit of the Valley Resource Area (Figure 2-8).

Mountain grouse and ring-necked pheasant would suffer habitat losses also, but most of their habitat is not near areas of major oil and gas operations in the Lewistown District.

Loss of Hungarian and chukar partridge habitat would occur, but this could possibly be offset by the benefits of more weed-type plants invading disturbed areas. Weeds provide not only cover to these birds but food in the form of weed seeds.

Severe effects on wild turkey populations from oil and gas operations are a possibility because of the turkey's secretive nature and general intolerance to human activities. Roads constructed into undisturbed turkey habitat could create intense hunting pressure on these birds, as well as increased poaching. The result could be the overhunting of a local breeding stock.

Game birds might benefit from some oil and gas activities, too, as good-quality surface water could be created in arid areas. This water would have to be further developed, however, by a private, state or Federal agency.

Game bird losses would be mostly localized, being the greatest on full development of an oil or natural gas field. Impacts would cease after abandonment and reclamation of wells, except for the continued use of roads. It is impossible to quantify losses to any game bird species in this district because of the lack of information and the size of the area being considered for oil and gas leasing.

Waterfowl

Exploration would cause little direct mortality to waterfowl, but impacts from oil and natural gas development and production could be significant. Accidental spills and leaks of oil or other toxic substances into aquatic habitats would trap or poison birds landing on them. These substances would kill soil and aquatic organisms used as food and cover by waterfowl, too.

During development, nesting cover near aquatic habitats would be destroyed, causing a resultant reduction in waterfowl populations. Springs, seeps and other water sources serving as waterfowl habitat could be altered by construction. Additional production would be lost if human activities discouraged nesting, which could happen during any stage of oil and gas operations.

Some beneficial effects could occur if good quality water from oil or natural gas wells created new habitat for migratory ducks. Some wells could produce warm water which would encourage ducks to remain in the district later in the hunting season, increasing hunting opportunities for local sportsmen.

Furbearers and Predators

Furbearers and predators would be slightly affected from oil and gas operations, from indiscriminate shooting and possibly from vehicle-animal collisions. Oil spills and leaks, and the introduction of toxic substances into aquatic habitats would cause losses among mink, muskrat and beaver populations.

Surface disturbances destroying the habitat of prey species would reduce the food sources of predators and could lead to smaller populations of the coyote, fox, skunk and badger. Lower quality aquatic and riparian habitat could lead to smaller populations of mink, muskrat and beaver, as well as raccoon.

More than any other factor, human activities would affect large predators. Black bear, coyote, northern Rocky Mountain wolf (an endangered species), mountain lion and bobcat are secretive, avoiding man as their best protection. They could be driven from their former habitat if human activites became persistent.

Nongame Animals

Small mammals would be killed by excavations, especially during drilling and development. Road construction and more vehicle travel through an area would result in more vehicle-small mammal collisions. Operations directly on a prairie dog town would severely deplete this population. In addition, indirect mortality from habitat loss would be severe on particular sites if the entire home ranges of small mammals should be destroyed.

Bird nests and young birds would be destroyed during exploration, drilling and field development. Road kills of small birds and raptors feeding on road-killed mammals could be expected to increase. The illegal shooting of raptors might occur. Powerlines would also present a hazard to raptors if not constructed to certain specifications. Industry accidents causing water pollution would kill some shore birds.

Indirect mortality of nongame birds from habitat loss due to construction would occur, this loss being in proportion to the importance and type of habitat destroyed.

Some benefit to small birds and mammals could be realized from weedy type plants invading disturbed areas. These plants would provide additional cover and food preferred by certain species.

Persistent human activities near raptors' nests could force these birds to abandon their nests and even their offspring. Raptors are fortunately widely dispersed throughout the area, and the overall possibility of this occurring would be slight.

Dryland reptiles, such as certain lizards and snakes, would suffer directly from construction and indirectly from habitat loss. Accidental spills of oil and toxic substances into aquatic areas would lead to the loss of amphibians such as frogs and toads. All of these impacts could be substantially long-term. Beneficial effects could occur if good quality water from oil and gas wells were used to create additional habitat.

There is little information on the diversity and numbers of invertebrates in the district, but it is thought that oil and gas operations could reduce populations and change the composition of species. This would be important to higher species because invertebrates are vital in the food chain. Leaks of oil and other toxic chemicals into aquatic areas would destroy aquatic invertebrates like snails and crustaceans, important as food sources for fish and some other small mammals.

Endangered and Threatened Species

Oil and natural gas operations would probably affect threatened and endangered species slightly. The presence of threatened and endangered species in the district is either unverified or the populations are extremely small. Certain situations, however, could cause negative impacts to a single animal.

The destruction of prairie dog towns could lead to the loss or reduction of habitat for the endangered black-footed ferret. It would certainly eliminate the possibility of re-introducing ferrets into that immediate locale.

Moderate human activities in previously undisturbed areas could cause the northern Rocky Mountain wolf, and possibly the black-footed ferret, to abandon the area. The illegal shooting of wolves (they resemble coyotes) would also be a possibility.

There is habitat used by migratory whooping cranes in the far northeastern corner of the district. Oil and gas operations near these areas could force the wary crane to avoid them. Accidental spills into the water there could also cause direct mortality.

The nesting areas of peregrine falcons and bald eagles could be abandoned because of human intrusion from oil and gas operations, too. Road construction could lead to the illegal shooting of these birds while the improper construction of powerlines could cause the electrocution of eagles. The latter presents the greatest probability of mortality to any threatened and endangered species.

Fish

Accidents which would introduce toxic substances into fisheries could kill fish. The possibility of this is minimal because of the restrictions normally placed on the oil and gas industry when operating near water.

Water from oil and natural gas wells reaching fisheries habitat could significantly change the water quality by raising temperatures to intolerable levels for some species of fish, by reducing aquatic food organisms and by encouraging the growth of rank vegetation and organic litter. These changes could significantly reduce game fish populations.

Building which contributed to accelerated erosion, causing more sediment from runoff into fisheries habitat, could cause significant negative impacts. Spawning beds might be damaged, eggs smothered and aquatic insect-producing areas destroyed. The severity of these impacts would probably be in proportion to the surface disturbances and the length of time disturbances remained unreclaimed.

RECREATION

BLM's recreation program normally includes wilderness, aesthetics and cultural resources. These subjects are considered separately in this document, however. The main forms of recreation on public lands in the district are hunting, fishing, sightseeing, off-road vehicle (ORV) use, and hiking, camping and canoeing along the Upper Missouri Wild and Scenic River. Recreation use is expected to increase dramatically in the next 20 years as the population grows and leisure time increases.

Types of recreation in the district conflict with each other to some degree, and with oil and gas operations. More access roads, for instance, would benefit hunting, sightseeing and ORV use but might adversely affect the primitive character of some areas desired by hikers and canoers. Conflicts would be more likely in certain areas, an example of which is shown in Figure 2-9.

Impacts to recreation from oil and natural gas development are considered in this section by the stages of oil and gas operations.

Preliminary Exploration

This stage often results in off-road vehicle use and high blading of seismograph roads. This might lead to more ORV use by hunters and other recreationists, a beneficial impact to ORV enthusiasts but offending those desiring pristine, undisturbed areas.

Exploratory Drilling

The impacts to most recreational uses from exploratory drilling would be beneficial if oil and natural gas development stopped at this stage—but it doesn't. The short-term impacts of dust from more traffic and noise from drilling would cause relatively minor disturbances. If the well were abandoned after use and reshaped, the pad would be unnoticeable. New roads would allow increased access by hunters and campers to areas previously remote. More use would cause indirect impacts, i.e. increased erosion, the greater possibility of destruction to cultural resources and increased hunting pressure. It should be noted that the effects could be long duration. The impact on recreational quality would depend upon the capacity of these areas to support the additional demand.

If new access roads led to increasing ORV use from them, the affected area might end up much larger than the site of the original oil and gas operation.

Development and Production

The effects of this stage of oil and natural gas operations on recreation would depend upon the topography and soils of the area and the prevalent types of recreational use. The impacts four current fields have had on recreational activities can be used to project how oil and gas operations would affect recreation on public lands. These four fields are the Whitewater area in Phillips and Valley Counties, the South Bear Paw-Leroy Field, the Kevin-Sunburst area oil fields and the Elk Basin area oil fields near Belfry (Figure 2-10).

The Whitewater Field is a shallow natural gas field on rolling, glaciated prairie with the wells spaced at least 640 acres apart. The primary impacts are on sightseeing and hunting during drilling and pipeline construction. These are short-term since reclamation only requires one or two years. Long-term impacts to game species would have an enduring effect on hunter days, but these impacts are insignificant.

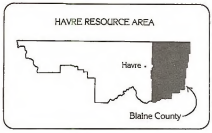
The Leroy Field is also a shallow natural gas field with 640 acre spacing in the rough, broken breaks area north of the Missouri River. Development, including in-field collection lines, major transportative gas lines, permanent access roads and dog houses will change the remote and primitive character of this area. An increase in hunter days because of better roads is expected, beneficial only so long as the greater hunting pressure does not adversely affect game populations. If this field should extend into the Upper Missouri Wild and Scenic River Corridor, the primitive character of the river might be upset unless appropriate mitigation measures were insisted upon in the leases.

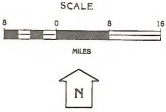
The Kevin-Sunburst oil fields, established in the 1920's, are probably the most disturbing developments in Montana from the aesthetic viewpoint. Wells here are sometimes on 5-10 acres spacing and sections of the field are littered with abandoned equipment and other debris. Although big game have adapted to this situation, the sightseeing opportunities are less than they are in other producing fields. It should be noted that any future oil and natural gas development would probably not be allowed to degrade the landscape to the condition of the Kevin-Sunburst Fields.

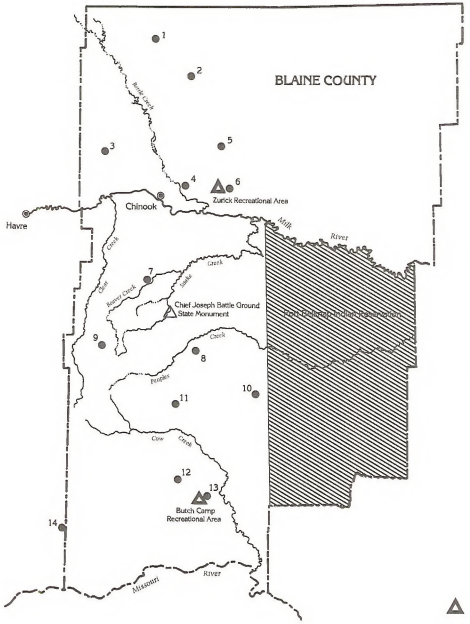
Oil and gas fields in the Belfry area are in poorly vegetated "cuestas"—land elevations with gentle slopes on one side and cliffs on the other. The area receives heavy ORV use because it is near Billings. Competitive ORV races have been held in the Elk Basin area. Greater traffic has rescarred previously disturbed areas around pipelines and has caused the destruction of waterbars in some areas in these fields.

From these four examples, the major impacts from the development and production stages would be increased recreation access, disturbance of primitive values and the possible increase in ORV use. Access roads provide corridors of use and sometimes improve hunting opportunities. As can be imagined, roadless areas (whether designated wilderness study areas or not) would be affected by development. Although there are safety hazards in oil fields (noxious fumes, heavy equipment and potentially explosive chemicals), more access roads lessen the chances of running into hazards. Intensively used areas also affect recreational uses like hunting, hiking, camping and sightseeing, which depend in some degree on solitude. These impacts would be most severe in designated recreation areas. Oil fields would cause more severe impacts than natural gas fields because of the need of the former for water pits, horsehead pumps and tank facilities.

FIGURE 2.9 RECREATION SENSITIVITY OVERLAY FROM HAVRE RESOURCE AREA, (BLAINE COUNTY)







FISHING RESERVOIRS

1. Burns (BR-45)
   Rainbow Trout
2. Dons
   Rainbow Trout
3. Rewer
   (not recently stocked)
4. Salmo
   Rainbow Trout
5. BR-12
   Largemouth Bass, Channel Cat
6. North Faber
   Rainbow Trout
7. Grasshopper
   Rainbow Trout
8. Faber
   Rainbow Trout
9. Ross
   Cutthroat
10. Putman
    (not recently stocked)
11. Upper Hanson
    Rainbow Trout
12. Al's Coulee
    Rainbow Trout
13. Butch
    Rainbow Trout
14. Carrol
    Rainbow Trout

STREAMS

Battle Creek
Brook Trout

Milk River
Walleye Sauger Pike
Channel Cat

Clear Creek
Rainbow Trout Brown Trout

Bear Creek
Brook Trout

Peoples Creek
Brook Trout

Cow Creek
Brook Trout

Missouri River
Pike Walleye Sauger
Channel Cat Ling
Sturgeon

△ RECREATIONAL AREA

SOURCE: BLM 1981

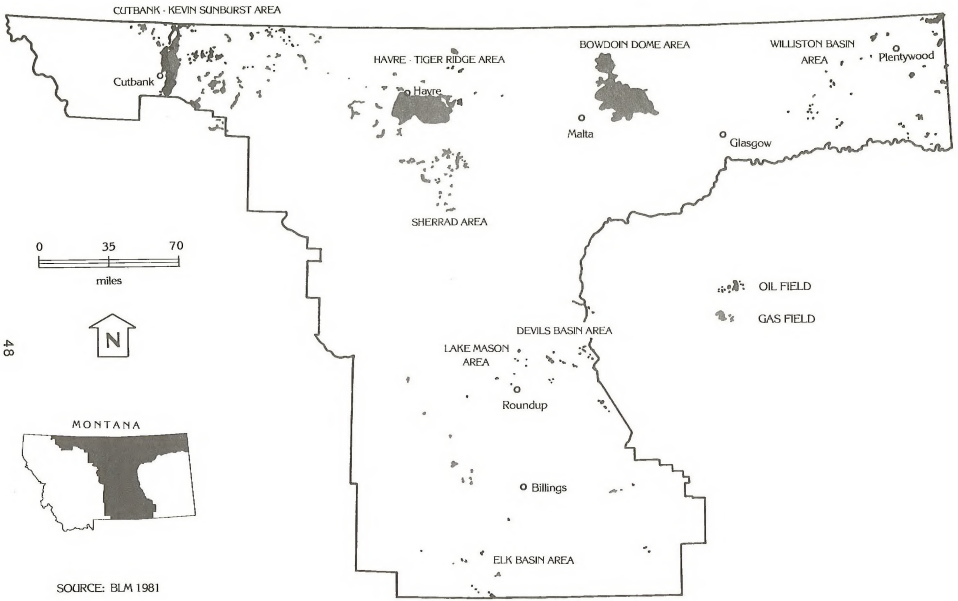


FIGURE 2.10 GENERAL LOCATIONS OF OIL & GAS FIELDS IN THE LEWISTOWN DISTRICT

Benefits from oil and gas field operations could include improved and safer access, acquired legal access, more signs and increased streamflows through discharge water (if it were of good quality) from oil or gas wells. Conversely, recreation might be adversely affected if the field disturbed critical wildlife habitat, allowed too much access into fragile soil areas or vegetation communities, reduced areas of roadless lands, increased the danger from field operations or introduced toxic substances into fisheries water. The possibility of either benefits or adverse impacts would depend entirely on the location of the new fields.

Abandonment

Use of the area for recreation might continue after abandonment. See the "Exploratory Drilling" Section.

AESTHETICS

For the purpose of the EA, this section will deal with how humankind perceive their environment through their senses. Landscapes have definable characters determined by how four qualities are perceived: form (the mass or shape of the landscape), color (differences in hues among plants, soils and water during different seasons), texture (the size, shape and placement of the parts of a landscape, their uniformity and the distance from which the landscape is viewed), and line (abrupt changes in any of the other qualities, e.g. ridgelines, changes in vegetation, skylines, manmade structures, etc.).

Senses primarily affected by oil and gas operations are sight, hearing and smell. The effects on sight are part of the Visual Resource Management (VRM) System in the BLM. (Impacts from sounds and smells are considered under the "Animals" and "Climate and Air Quality" Sections.) The VRM system is an attempt to quantify how humans perceive their visual environment. Three basic questions are asked in the system: "what is there?" (scenic quality), "who sees it?" (quantity and proximity of use), and "who cares?" (user reaction). The answers to these questions are used to divide the district into similar physiographic areas. Each area is rated on its scenic quality ("a, b or c"), public reaction or sensitivity to it ("high, medium, low") and the delineation of roads or trails ("travel zones") in the area. The scenic quality, sensitivity and travel zones ratings are combined in order to classify a region into any of five visual resource classes.

Types of areas that fit in each VRM class, limitations of land use and specific examples of these classes may help the reader better understand the VRM rating system.

VRM Class I—This class applies to designated primitive areas, natural and wilderness areas; it allows for natural ecological changes only. Examples of this class include "wild" and "scenic" segments of the Upper Missouri Wild and Scenic River area, the Square Butte Natural Area and Beartooth-Absaroka Wilderness.

VRM Class II—Class II includes areas of high scenic quality or areas of average scenery in sensitive areas such as along major roads. Examples of this class are parts of the Pryors, Judiths, Little Rockies and other small mountain ranges, some parts of the Missouri Breaks (including the "recreational" segments of the Upper Missouri Wild and Scenic River) and all roadless areas. Changes caused by oil and natural gas operations should be hidden and well blended with the natural landscape in these areas.

VRM Class III—This class contains areas of average or lower scenic quality on or near travel zones, including areas along highways and most small mountain ranges not included in Class II. Changes here should be in harmony with the natural landscape.

VRM Class IV—The majority of the district is in this class which includes most of the Hi-Line area of northern Montana and the relatively monotonous rolling wheat and pasture fields common to the northwestern plains.

VRM Class V—These are areas that have many manmade intrusions that are not pleasing to the perceiver. This category may fit old oil fields, large mining scars and the fast-food rows on the outskirts of Montana's largest cities.

VRM inventories were initiated in the district in 1975. All of the Hi-Line area, the Bull Mountain Planning Unit near Roundup and the Judith Resource Area have been inventoried under this system. VRM classes in the Fergus Planning Unit in the Judith Resource Area have been included in Figure 2-11 as a further example of the VRM system.

Once the VRM classes are determined, projects like oil and gas operations are evaluated by determining the contrast between the project and the landscape. This contrast is obviously influenced by the distance of the project from the viewer, the length of time it is in view, the position of the viewer (above, below, level), the relative size of the project and the season. The VRM Classes determine the maximum contrast allowable—a project should blend in well with the surroundings in a Class II area but this would not be as critical in Class IV. If a project is determined to be unacceptable, an attempt is made to relocate it or mitigate the dominate contrast (form, color, etc.), so that it is less visible.

Each stage of oil and gas operations is rated in this section on the effects of changes in landscape, vegetation and the building of structures associated with development. Although there would be many imponderables, the average visual impacts from each stage could be quantified.

Natural gas fields normally have less visual impact than oil fields. Gas developments in the Leroy Field (south Blaine County) and the Whitewater area (north Phillips County) are shallower wells requiring smaller pads than

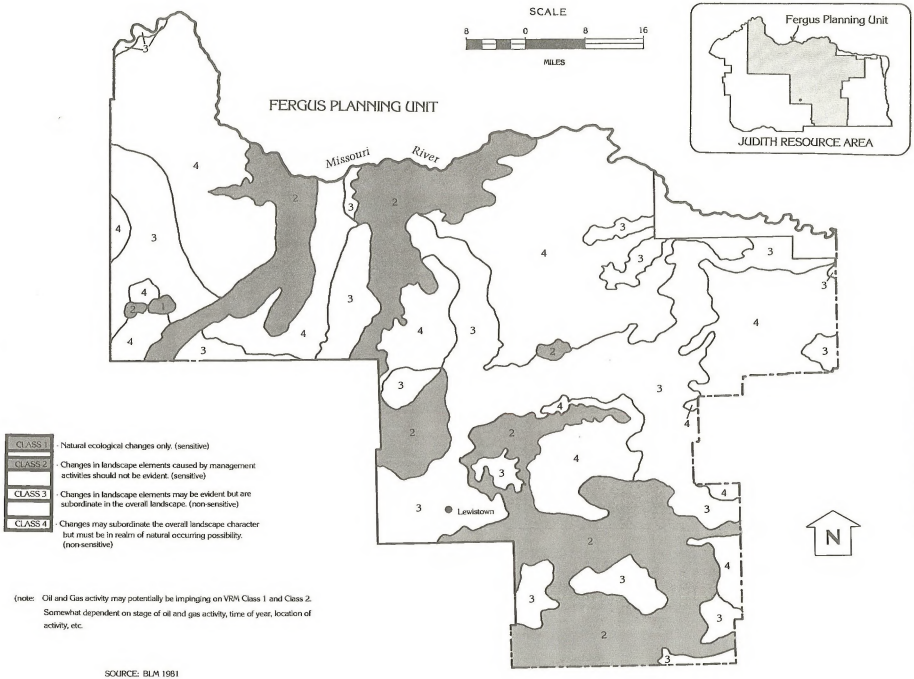


FIGURE 2.11 VRM CLASSES IN THE JUDITH RESOURCE AREA (FERGUS PLANNING UNIT)

oil fields in the district. Also, gas production does not require the tank batteries, mudpits, horsehead pumps or secondary recovery equipment (e.g. water treaters) that oil production does.

Preliminary Exploration

Road construction and the high blading of sagebrush would be the primary impacts of preliminary exploration. If the seismic lines were straight, there would be moderate effects on the line of the land surface and vegetation and lesser impacts to form, color and texture. This sort of disturbance would be allowable in all but VRM Class I and Class II areas.

Exploratory Drilling

These impacts would include the construction of roads and pads. As long as steep cuts are unnecessary, exploratory drilling would have moderate or low impacts on the form and line of the landscape and vegetation. These effects would not be allowed in Class I areas and might not be allowed in Class II areas, depending on the specific project. Steep cuts are difficult to reclaim and leave visible scars which would not be permissible if any alternatives existed.

Development and Production

The most severe visual impacts from oil and gas operations would be from these stages. The visual effects of development drilling would be usually severe immediately around the well and drilling might occur over a wide area. Within a known geologic structure where there is a lot of drilling, the landscape is usually industrial in character, at least in the foreground. Also, the regular spacing of the wells might impose a regular drilling pattern on an irregular landform.

Usually production facilities radically alter a landscape. Preliminary exploration and developmental drilling require access roads, levelled drill pads, off-road trails and tank facilities. Production facilities—moving horsehead pumps, above or below-ground collection lines, powerlines and especially the single-color galvanized tanks—would guide the viewers' attention to the disturbed area.

Some of the facilities could actually add variety to an otherwise monotonous landscape. Wells might offer relief to the rolling topography common to parts of the Hi-Line area. The more varied the landscape, however, the greater the possibility that the intrusion would detract from rather than add to visitors' experiences.

It is expected that this stage of oil and gas operations would have moderate to low effect on the form of the landscape, moderate effect on the line and color, and little effect on the texture. Changes in vegetation from this stage would have little effect on the line and color of the vegetation. Structures would have moderate effect on the form and texture of the landscape and moderate or high effect on the line and color. If unmitigated, this stage would cause unacceptable changes in Class I or Class II areas and changes that could be either acceptable or unacceptable in Class III or Class IV, depending on the specific project.

Abandonment

During this stage the landscape is restored, the vegetation reseeded and access roads may be put to bed.

Production facilities are also removed. Generally the visual resources of the area would be improved after abandonment. In areas like the Missouri Breaks and the Elk Basin area, however, reclamation might be a slow process. Moreover, many of the worst looking fields might not be abandoned for at least 20 more years and the continued use of the access roads for recreation would probably mean that efforts to put the access roads to bed would be futile.

The VRM program on public lands needs the cooperation of private landowners and the state to be effective. For instance, if BLM required all gas "dog houses" to be painted or camouflaged, the effort would be ineffective if only those on BLM-managed lands are painted while those on private or state lands glisten from the ridgetops.

Also, the U. S. Geological Survey has control over the area of operations. Visual improvements (such as painting) will be subject to the approval of the District Engineer, requiring coordination between BLM and USGS.

WILDERNESS

The leasing of land in Wilderness Study Areas (WSAs) would not have a negative effect on wilderness values, per se, but the impacts of oil and gas exploration and development would, at some point, probably cause the average person to feel that wilderness resources were degraded.

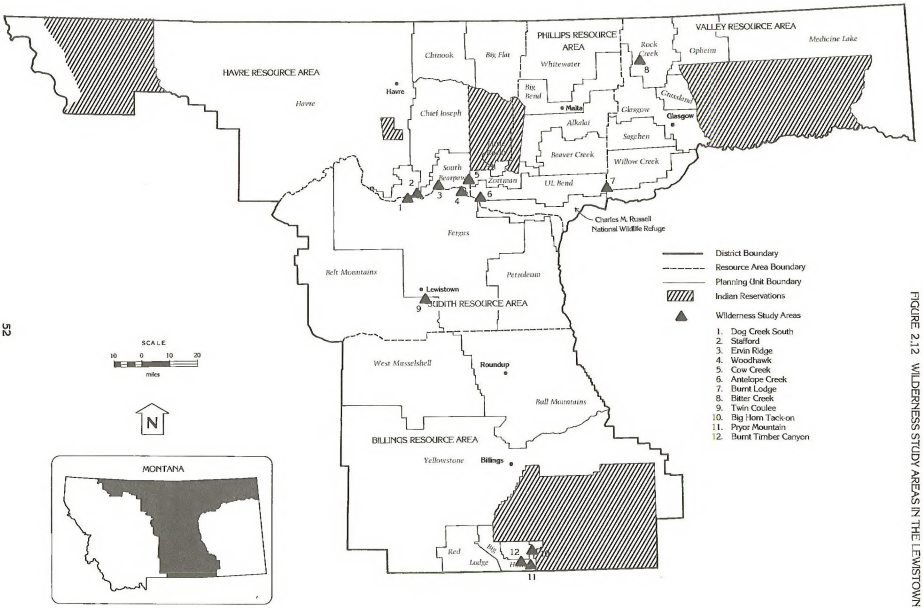
In general, road construction reducing the inaccessible confines of an area, surface disturbances to the point that either the natural integrity or the apparent naturalness of an area were degraded, or signs of man's presence becoming pre-eminent in the environment would be the major impacts on wilderness of oil and gas operations.

More people living and working nearby might cause a slight increase in the recreational use of wilderness study areas (Figure 2-12) but this impact would be insignificant.

Preliminary Exploration

The operations of preliminary exploration (the presence of aircraft, vehicle tracks, shot hole cuttings, explosions and other sounds, dust plumes from explosives, litter) would be minor impacts. These operations, resulting in an apparant loss of the natural integrity of the area and a noticeable, though fleeting, loss of solitude, would disturb wilderness values for anywhere from a few seconds (in the case of noise) to decades or more (in the case of discarded trash).

Criss-cross patterns of compacted vegetation from seismic operations would be an adverse impact to wilderness at this stage, too. Straight-line vehicle compaction tracks would create significant (though temporary) impacts, depending upon growing conditions. Heavy secondary use and maintenance operations along



SOURCE: BLM 1981

FIGURE 2.12 WILDERNESS STUDY AREAS IN THE LEWISTOWN DISTRICT

these trails would create roads, and subsequent use of the roads would effectively partition previously roadless areas.

Exploratory Drilling and Development

Wilderness values would be affected by oil and gas drilling. Drilling rigs might cause severe audible and visual impacts for the duration of the operations. Surface disturbances would also cause visual impacts, depending on the depth of the well and the topography of the area. The effect of vehicle trails would be similar to that for "Preliminary Exploration." These impacts could be mitigated by rehabilitation.

Since oil and gas leases let before 1976 need not adhere to wilderness stipulations, oil and gas operations could proceed even at the risk of impairing wilderness values, as long as unnecessary or undue degradation did not take place. On post-1976 leases with a wilderness stipulation, the limitations govern the level of oil and gas operations.

Production

Pre-1976 leases would permit impacts from operations like drilling or construction of production-related facilities. Operations on these leases might continue, even if impairing to wilderness values. Operations begun outside the boundary of a WSA might be continued inside as long as the "logical pace and progression" of such development followed standard industry procedures and the effects were not significantly different in kind. On post-1976 leases with wilderness stipulations, oil and natural gas production operations would be permitted only if they were "non-impairing" to wilderness values as defined in BLM's *Interim Management Policy and Guideline for Lands Under Wilderness Review* (IMP).

A recent legal opinion concluded that buried pipelines from oil and gas production facilities are allowable in WSAs if they can be built, used, terminated and restored to non-impairment by the time the Secretary of the Interior makes his recommendation about wilderness designation to the President.

Abandonment

During this stage, major above-ground structures (other than a location monument) would be removed, leaving only access routes and surface disturbances around the drilling site. Revegetation would erase all but minor traces of past use.

PREHISTORIC AND HISTORIC FEATURES

Since only about 5% of the Lewistown District has been studied for prehistoric and historic sites, the exact location of sensitive areas is still largely undetermined. The inventories completed, however, show that some impacts to prehistoric and historic sites have occurred from oil and gas operations in the past. Thus far studies in the northern, central and southern portions of the district show a range of from 0.5 to 6.0 cultural resource sites per square mile or 640 acres (Figure 2-13). No areas are completely devoid of sites while some areas have a relatively high density (Figure 2-14).

Surface disturbing activities cause the most severe impacts on cultural resource sites. An archaeological or historic site consists of features or structures and artifacts, representing the past life of humans. In order to accurately interpret the features and artifacts, their relative position to one another must be preserved intact. A concentration of stone tools and animal bones located in close proximity to a fire hearth allows the former to be dated, an estimation of the number of people at the site can be made and the animals or parts of animals used for food can be identified. This gives a general idea of environmental conditions in the area at that time.

If the ground containing these features were churned up, three basic impacts would be caused: (1) the objects and features of the site could no longer be related to one another because their scattering would make it impossible to prove that they were once located together; (2) the bones and hearth could be totally destroyed; (3) the interpretive value of remaining artifacts would be drastically reduced because there would no longer be datable material, organic materials could be destroyed, and the context of all materials would be altered.

Preliminary Exploration

This stage would not include significant ground disturbing operations but certain types of terrain or specific methods could affect cultural resource sites. Although much of the district is generally rolling or gentle topography, there are isolated areas which would require limited road construction before rubber-tired vehicles could be used e.g. drainage crossings. It is impossible presently to determine areas in the district that would require construction. Another operation which could affect prehistoric or historic features during this stage is the use of explosives to generate seismic waves. This could cause exfoliation or cratering, thereby damaging sites.

Exploratory Drilling and Development

Exploratory drilling and development of oil and gas would cause the most severe effects on cultural resource sites. These stages usually would require construction of drill pads and auxiliary facilities for production, including mudpits, waste piles, reserve pits, tanks and flowlines. Access roads would be required in most cases though not in all. All of these operations would severely damage and probably destroy cultural resource sites where development occurs.

Production

Production would not cause further surface disturbances unless new wells were added to the successful exploration wells. Effects would then be limited to the immediate vicinity of these new wells or to the oil/gas gathering lines or access roads serving them.

FIGURE 2.13 IMPORTANT PREHISTORIC & HISTORIC CULTURAL SITES IN THE BILLINGS RESOURCE AREA

SOURCE: BLM 1981

Examples of Sensitive Cultural Resources in Billings Resource Area

Map Number

1. Pictograph Cave. Excavations determined the sequence of prehistoric occupation in the Northwestern Plains. Four cultural levels, ranging from middle prehistoric to historic times were recognized.

2. Thirty Mile Mesa Village Site is a late prehistoric to historic village site selected for its exclusive properties.

3. Pretty Creek Archaeological Site contained records of aboriginal occupations from 7000 B.C. to the Nineteenth Century. Excavated materials include campsite debris, hearths, and a Vision Quest structure exemplifying a number of activities in a confined area.

4. Bighorn Canyon Sites (includes Mangus Site, Sorenson site, Bottleneck Cave) represent the Paleo Indian and later periods.

5. Bandit Site is a Late Archaic Period campsite where wild seeds and ants were processed for consumption.

6. Petroglyph Canyon contains examples of pecked rock art. Most petroplyphs in Montana are scratched or rubbed rock art.

7. Crooked Creek Canyon contains a number of rockshelters with very early prehistoric occupations.

8. Hoskins Basin Archaeological District contains the remains of two (once common, now rare) late prehistoric to historic aboriginal wooden dwellings. The dwellings are conical and cribbed house types.

9. Demijohn Flat Archaeological District illustrates the following activities: 1) massive and small temporary encampments 2) lithic tool manufacture; 3) rock art; 4) hunting.

Map Letter

A. Canyon Creek Battlefield is where Col. Samuel Sturgis and the 7th Cavalry attempted to overrun a Nez Perce encampment along the creek. The Nez Perce were successful in that the families and herds escaped at the mouth of the North Fork to the open prairie. However, the fight kept the Nez Perce on the run and further exhausted their supplies and horses.

B. Pompeys Pillar is a massive 150 foot high sandstone block which was a landmark of the Lewis and Clark Expedition. In 1806, Clark named the rock for Sacajawea's son, and carved in his signature which remains visible today.

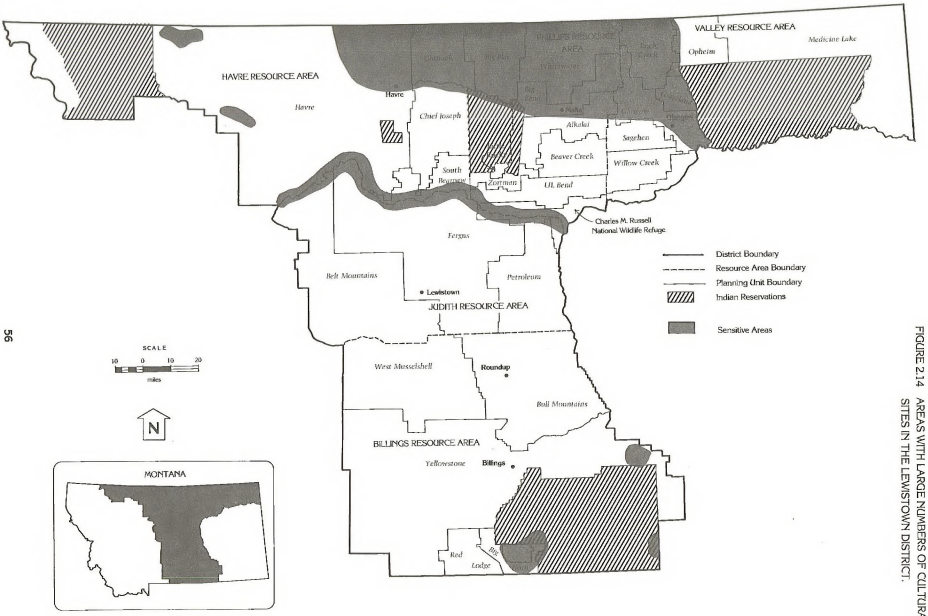
C. Battle of the Rosebud Site is the battle which constituted a major engagement of the Sioux War of 1876-77. Brig. General George Crook is credited with a "tactical" victory. The battle involved a greater number of troops and resulted in fewer casualties than did the Little Big Horn eight days later. It was one of the largest Indian battles ever waged in the United States.

D. Custer Battlefield (Battle of the Little Bighorn) is the scene where Lt. Col George Custer and his troops were annihilated by the Sioux and Cheyenne Indians June 25-26, 1876.

E. Bighorn Canal Headgate is a stone and mortar headgate built by the Crow to control the flow of water into the Bighorn Ditch. It was a major work of art connected with the massive irrigation project undertaken by the Crow at the turn of the century.

F. Fort C.F. Smith Historical District was built in 1866 as one of the series of posts along the Bozeman Trail. The fort was a favorite trading center of the Crow Indians. It functioned primarily as an eastern bastion for the southern Montana settlements.

G. Chief Plenty Coups Memorial is in dedication to the friendship between early settlers and the Crow Indians. Chief Plenty Coups, born in 1848 near Billings, was the Crow Nation's leader and one of the most influential older leaders. His ranch home, store and gravesite are located here.



SOURCE: BLM 1981

FIGURE 2.14 AREAS WITH LARGE NUMBERS OF CULTURAL SITES IN THE LEWISTOWN DISTRICT.

Abandonment

Abandonment would not affect cultural resource sites unless the rehabilitation of the well included surface disturbances beyond that of the original construction.

ECONOMIC AND SOCIAL CONDITIONS

Economic and social impacts from oil and gas development would most likely occur during the large-scale field exploration and development stages. In almost all cases, these impacts would center around the communities where the oil and gas workers choose to live. Immediate effects from oil and gas fields in the past have been greater demands for housing and other basic facilities (water, law enforcement, recreational opportunities, etc.). These must be available to accommodate any sizeable growth in population.

For the purposes of this EA, it is assumed that the direct employment in a major oil and gas field would be 190 employees in the development stage, 35 during the production stage. In addition seismic crews would add 10-15 workers per crew on the average. These were the typical employment levels in the Bell Creek Field of southeastern Montana, a significant oil and gas development in the late 1960's.

Assuming that 50% of the oil/gas workers were married and that 50% of those brought their families with them (3.5 people per family), it is likely that major field development would bring in a total population of around 300 people. An average of 75% of the workers would choose to reside in the town with the greatest number of amenities within commuting distance of their jobs. The remaining 25% typically would use trailers or campers for housing. In most cases the married workers with their families would reside in houses or apartments in town while the single workers would be more likely to live in trailers or campers. Of the 190 workers involved with the development stage of a major field, 48 with families would be assumed to seek housing in town. Of the remaining 142 workers, 71 (50%) would also attempt to find housing in town with the remainder (91) living in trailer houses on the outskirts of town or near the drilling rigs.

A work force of this size would require approximately 119 housing units (excluding trailers) in towns within commuting distance of oil and gas fields. The population influx into a town in commuting distance from a major field would be approximately 240 people (48 with families at 3.5 members per family and 78 without families).

Table 2-7 shows the social-economic effects likely to occur in the towns near potential oil and gas fields. This table is in the form of a sensitivity rating, representing the probable effects on the communities' present and future housing and public service capabilities from the presumed population and employment increase (see also Appendix 4-5). In addition the table also considers the relative size of each community, assuming that a larger community will generally be more able to absorb added population than will a smaller community, other things being equal. A community with adequate housing and public services currently is classed as sensitive while those with inadequate housing or public services are classed as critically sensitive.

TABLE 2-7: PROJECTED COMMUNITY SENSITIVITY TO MAJOR OIL/GAS FIELD DEVELOPMENT

1.	Plentywood	1
2.	Wolf Point	2
3.	Scobey	2
4.	Glasgow	2/3
5.	Malta	2
6.	Chinook	2
7.	Havre	2
8.	Chester	2
9.	Shelby	1/2
10.	Cut Bank	2
11.	Fort Benton	2
12.	Lewistown	2
13.	Harlowton	2
14.	Roundup	2
15.	Big Timber	2
16.	Columbus	2
17.	Billings	3
18.	Hardin	2
19.	Red Lodge	2

Critically Sensitive = 1
Sensitive = 2
Non-Sensitive = 3

Source: BLM, 1977.

LAND USE

Oil and gas operations would have a significant impact upon land use. These effects would be generally centered in the communities nearest the oil and natural gas fields. These small communities would be severely affected since they often are not prepared to cope with unexpected population growth with its attendant demands for goods and services. Frequently there is little land use planning information to provide for orderly community expansion. Lands could be developed with little or no long-range plans and without consideration for land-use suitability. There is also a lack of land suitable for housing development. When land is available, subsequent development could change the character of the land which might be incompatible with surrounding uses.

By occupying the land, oil and gas companies could prevent or delay the disposal of lands and subsequent transfer of ownership in many cases.

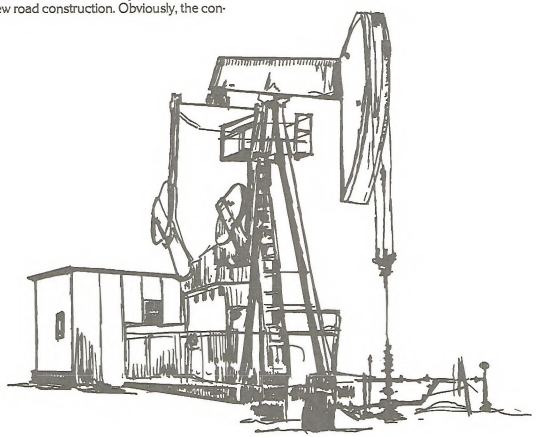
Although most of the communities in the district have enough private land to allow for future expansion, it would be possible that some federal lands might be needed for this purpose in the future. Federal land could be requested for use as temporary housing sites or for townsites near producing fields in remote areas. The effects from such an action would depend upon the location and magnitude of the proposal and would have to be studied on a case-by-case basis.

Oil and gas operations would also affect land use by taking land out of forage or agricultural production; however, but the acreage affected would be very small. Even after the land has been cleared and drill pads, pits, storage tanks and wells have been constructed, the total amount of land encumbered would seldom be more than 2 acres in size. Oil and gas operations average less than 1 acre, excluding land taken for access and service roads.

Although major highways and county roads would be used as much as possible, it would often be necessary to build access roads for transporting drilling equipment to the fields. Assuming that a right-of-way would be 48 feet wide, about 6 acres of land per mile would be affected by new road construction. Obviously, the construction process would remove some land from forage and agricultural production. Erosion and littering problems would also result. However, the main effects on land use would come from the additional public access to lands previously inaccessible. Access roads would be readily used for recreation, adversely affecting the environment before plans could be made to protect it.

Once a producing field was located, further oil and gas operations would require a network of powerlines and pipelines. Powerlines would present visual distractions, take land out of forage production and preclude other uses. If a service road were constructed, 3-4 acres of land per mile would be necessary to maintain the line. Service roads (depending upon the soils and the amount of use they receive) could lead to rutting, sheet erosion and permanent scars upon the land surface.

Pipelines, usually buried beneath the ground, do not disrupt the land visually the way above-ground facilities do. Soil erosion, however, could be severe unless the soils were properly packed and reseeded with a mixture of fast-growing vegetative species. Above-ground spillage and subsurface seepage of toxic substances could adversely affect downstream land uses, also.



2.3 Mitigating Measures

This section of the EA describes measures which would reduce or eliminate negative impacts from oil and gas operations in the district. The scope of this document makes it impossible to prescribe mitigation on a case-by-case basis. Consequently, many of the measures which follow would not apply to all sites, applying instead to those areas with environmental features sensitive to oil and gas operations (e.g., fragile soils, endangered species, etc.). In the Lewistown District, stipulations at the time of leasing are proposed by the resource area personnel. The district surface protection specialist and resource specialists attach mitigation to specific leases at the time of the predrill inspection, using the protective measures proposed in this EA as guidelines. Appendix 2-1 presents the present BLM/USGS stipulations, a listing of the most often used mitigating measures.

Special lease stipulations would limit the lessee's normal enjoyment of the lease if they were necessary. Portions of the lease might be closed during all or part of the year because of the needs of wildlife, watershed or other reasons. Roads might be closed at certain times. Other special situations might be evident at the time of lease issuance which would require unique or unusually expensive steps by the lessee, involving extremely unstable formations, extremely high pressure water flows or identified critical habitat for threatened or endangered species. The need for special stipulations must be supported in this EA or included in documentation with recommendations for the stipulation's use. This documentation would be included in the lease file.

Stipulations would be covered in the Application for Permit to Drill process for normal situations and covered in the "Multipoint Surface Use and Operating Plan" required by GS's Notice to Lessees No. 6 (see page 7 and Table 1-1, Chapter 1). This includes access road location, design and construction; construction materials; drill site and development facilities layout and construction; waste disposal; water supply; protection or recovery of cultural resources; proper engineering techniques; visual resource considerations; steps necessary for quick and successful reclamation; wildlife habitat protection; facility location; required soil or water testing; etc.

Methods of seedbed preparation and seed mixtures could be left open until the time the actual rehabilitation operation began. Where special species such as hard-to-find native seed, special seedings, or tree or shrub planting were anticipated, however, it should be stipulated at the time of approval of the APD.

Some of the mitigating measures listed served as guidelines in the preparation of the sensitivity overlays. Other mitigating measures are proper for use at the time of lease and others during the APD period.

CLIMATE AND AIR QUALITY

Classify as sensitive lands on wilderness areas or Indian reservations to maintain Class I air quality.

Water road surfaces and drill sites if dust becomes a problem.

Release waste gases into the atmosphere only during periods of good ventilation.

Maintain and use pollution control devices on internal combustion engines.

GEOLOGY AND TOPOGRAPHY

Classify as sensitive lands containing steep slopes and unique geologic features, common to areas such as the Missouri, Musselshell and Yellowstone River Breaks, and the Pryor Mountains.

Inject water as fluids are withdrawn if subsidence should occur during the withdrawal of subsurface fluids.

Restrict the use of explosives near unique geological features, such as caves and arches, to prevent their destruction.

Place production facilities so that those near important geological features do not detract from the human-interest values of the features.

Protect localities with known vertebrate paleontological sites. If vertebrate paleontological features are uncovered during oil and gas operations, leave intact and report to the District Manager.

SOILS

Classify as sensitive lands containing fragile and unstable soils.

Impose seasonal and/or daily restrictions on surface disturbing activities to avoid damage to soils when wet.

Reshape disturbed areas to the contour that will cause the least environmental harm and will encourage plant growth.

Stockpile topsoil separately for use in rehabilitation. Minimize the mixing of soil horizons by stockpiling suitable topsoil separate from other material.

Rehabilitate disturbed areas as soon as possible to keep soil losses by erosion to a minimum.

Restrict surface disturbing activities to the appropriate degree of slope, depending upon the activity and the type of soils involved.

Place seasonal restrictions for sensitive watershed.

Construct roads with adequate specifications to ensure proper grade and drainage. Culverts should be placed at appropriate locations to maintain present stream channels.

Design developments to conform to the present topography in order to minimize surface disturbances.

Lessen soil compaction from vehicles by ripping, harrowing, plowing, discing or other mechanical treatments of affected soils. Movements of water, air and nutrients within the topsoil would be increased to near normal levels thereby.

Use mulches, soil stabilizers and erosion control netting where necessary and practicable to retard wind and water erosion until revegetation is established.

Properly dike storage tank areas. Grade storage tank areas so that drainage would be away from the tanks and toward holding basins to minimize effects of oil and fluid spills.

Locate pipeline routes and access roads away from areas which might experience slope failure and have little potential for rehabilitation or reclamation.

Locate borrow pits and borrow areas away from roads and public use areas. Borrow areas should be stabilized and revegetated after use.

Line waste pits, reservoirs and mud pits, if located in permeable soils, to prevent mud and toxic materials from entering soils and water tables. Reserve and waste pits help reduce spills and contain drilling muds and formation fluids.

Channel sediment from water erosion to holding basins for retention prior to release into the watershed.

VEGETATION

Follow state standards for plugging seismograph shot holes.

Continue use of strict stipulations regarding the use of bulldozers in seismograph operations.

Locate well sites, tank batteries, reserve and mud pits far enough away from drainages to preclude contamination of the watershed.

Use present trails and roads where possible.

Allow temporary roads to be constructed for the necessary width only and avoid long steep fill slopes and cuts.

Locate roads, pipelines and other facilities to minimize the destruction of aquatic vegetation at stream crossings.

Construct dikes around all storage facilities.

Maintain all improvements in a servicable and safe condition, including fences, gates, cattle guards, roads, trails, pipelines, bridges, water developments and control structures.

Install waterbars, terraces or diversion ditches on the uphill sides of facilities to control runoff water in areas where needed, depending upon slopes and watershed values.

Limit, by adequate advance planning, the number and dimensions of pipelines, test wells and camp facilities and take advantage of road locations thereby minimizing surface disturbances.

Require rehabilitation of disturbed areas by methods which include revegetation with adaptable ground cover species, removal of foreign material, scarification of sites with compacted soils, irrigation and protective fencing.

Fence and flag mud separation pits and other hazardous materials to avoid poisoning humans, livestock, waterfowl and wildlife.

Require contingency plans from operators for controlling spills or leaks. Monitor all field activities closely for accidental spills and pipeline leaks. If a spill should occur, vacuum trucks, skimmer pumps and absorbent material should be used to remove the oil from the surface of any water contaminated. Absorbent material could be lain directly on exposed vegetation to pick up oil.

Require that the lessee and/or operators be responsible for noxious weed control during the life of the lease, relinquishing this responsibility upon abandonment.

Dispose of slash necessitated by oil and gas operations in timbered areas by methods stipulated by the authorized officer of the surface managing agency. Acceptable methods of disposal would be to lop and scatter, pile and burn or bury the slash.

Avoid range study plots to prevent the possibility of destruction.

WATER

(Many of the mitigative measures listed for soils would also apply to water resources because they would ultimately improve water quality. They do not need to be repeated in this section. The following mitigating measures will also be necessary in addition to those listed previously.)

Categorize major river systems such as the Yellowstone, Marias, Missouri, Musselshell and Milk Rivers as sensitive. Any surface disturbances within 500 feet or within the 100 year flood plain of these rivers should be examined by the district soil scientist and hydrologist and appropriate recommendations made.

Avoid surface disturbances and/or semi-permanent or permanent facilities within the 100 year floodplain of all perennial streams, on intermittent streams draining more than 10 square miles of watershed area, or on the contributing watershed and within 300 feet of any lake, reservoir and marsh whenever there is a practicable alternative. When there is no alternative, require an on-site inspection by a hydrologist and soil scientist who will determine the impacts of the proposed action and recommend mitigating measures.

Rehabilitate streambank disturbances from oil and gas operations.

Install waterbars on pipelines and abandoned roads on slopes greater than 30% at intervals to be determined by the authorized officer.

Require examination by district personnel of geophysical lines both before and after completion (e.g., overflights or on-the-ground examination).

Prohibit the subsurface detonation of explosives used in geophysical exploration within 1/8 mile (422 feet) of any well or spring.

Continue on-the-ground examination by BLM personnel of all drill pads and access roads before and after completion.

Limit earthmoving work to areas where slopes are less than 30% wherever feasible.

Revegetate all disturbed areas during the proper seeding time period.

Require that all evaporation ponds be diked and safe from the runoff from drainages. Dike and fill should be constructed of compacted fill. Reserve pits will be constructed below the natural groundline.

Encourage that mud pit fluids be pumped from the pit and rehabilitation take place as soon as possible. Require such measures in cases where the pit site could affect perennial water courses. This would depend upon the site's soil and drainage characteristics.

ANIMALS

Classify essential wildlife habitat as sensitive, e.g., grouse "booming" grounds, whooping crane habitat in eastern Sheridan County, critical elk habitat (South Willow Creek, Valley RA), prairie dog towns (South Phillips County), wild horse areas (Pryor Mountains), fisheries and goose and duck nesting reservoirs, etc.

Intensify the BLM wildlife inventories and record findings in appropriate Unit Resource Analyses, as well as on the oil and gas land classification overlays, when sensitive habitats are discovered.

Allow no surface occupancy within or near crucial wildlife areas (see "Glossary") or restrict the times of occupancy to periods when these areas are not crucial to wildlife. For example, allow no surface occupancy within: 1) 500 feet of grouse breeding grounds (special care to avoid nesting areas associated with breeding grounds will be necessary during the period March 1—June 30); 2) 1/4 mile from identified sensitive species' nests or within their crucial habitat during the period March 1—August 1; 3) 600 feet from white-tailed prairie dog colonies and 100 feet from black-tailed prairie dog towns; and 4) crucial wildlife winter ranges during the period December 1—May 15, and in elk calving areas during the period May 1—July 1.

Require reinjection of brine water into an acceptable subsurface strata.

Fence mud and skimmer pits to protect wildlife from entrapment.

Install "flasher" fences on all contaminated water pits to protect waterfowl.

Use vegetative species in revegetation efforts that would benefit wildlife species as well as providing erosion protection.

Design and install culverts to facilitate the passage of fish.

Rehabilitate damaged streambanks to improve fisheries habitat where appropriate.

Ensure that all power transmission lines be installed with raptor protection devices.

Require construction of "safety" dams downstream from pits or ponds to catch accidental spills when such accidental spills could adversely affect waterfowl or fisheries habitat.

Require that powerlines on or near heavily used flyways be placed underground if economically feasible.

Prohibit drilling water to be drawn from fisheries reservoirs.

RECREATION

(Recreation is not in itself an aspect of the environment. The components already discussed make up the environment that man might want to use for recreational pursuits of one kind or another. Because of this, mitigating measures that could improve recreational activities have already been listed under these other components. A few observations and further mitigative measures can be added here, however.)

Classify as sensitive developed recreation sites such as campgrounds (Montana Gulch and Camp Creek), scenic overlooks (Winddrinker) and fisheries reservoirs. The Upper Missouri Wild and Scenic River Corridor and Square Butte would logically be classified as sensitive also.

Allow no surface occupancy (unless the lessee/operator demonstrates that the special area is essential for operations) within 300 feet of occupied buildings, developed recreational areas or undeveloped recreational areas receiving concentrated public use, sites eligible for or designated as National Register sites, appropriate Areas of Critical Environmental Concern, wilderness study areas or designated wilderness areas, and Recreational, Scenic or Wild River areas.

Prohibit oil and gas developments from obstructing recreational access.

Locate and carefully restore access roads in areas limited or closed to ORVs.

Suggest that oil and gas companies develop additional recreation sites and provide funds to city and county programs to provide additional recreation programs for their employees during development and production stages.

AESTHETICS

Present lease stipulations (MSO 3100-47c; Appendix 2-1) provide for camouflaging semi-permanent facilities, as needed, to mitigate adverse visual impacts. This requirement would be more effective if imposed at the time of the prestake or the predrill inspection. With this in mind, the following mitigating measures are suggested:

Require painting or camouflage of all semi-permanent facilities to blend in with natural surroundings. The method of camouflage (paint color, etc.) will be at the discretion of the authorized officer, with approval by the District Engineer, USGS.

Avoid straight, lineal clearing lines (sagebrush and timber cover). Feather the edge clearing to resemble or blend as a natural clearing line.

Use native species in reseeding efforts where visual aspects are important to avoid the lineal visual impact of exotic species contrasting with the natural vegetation surrounding.

Avoid skylining or backlighting the semi-permanent facilities being located near major scenic areas. Blend the facilities with the natural setting. Use available screening materials such as trees, draws and secondary ridges.

Avoid large steep cuts; they are visible for long distances.

Locate facilities along the type line in areas with adjoining vegetation types (e.g. timber next to grass-sagebrush).

WILDERNESS

(Although the entire IMP is being considered in court, certain measures remain in force.)

All pre-1976 valid leases, with or without on-the-ground impacts, and with or without the wilderness lease stipulation, may be occupied, explored and developed so long as no unnecessary or undue degradation occurs. BLM has the right to direct the route and type of access into such leases but may not withhold access or require an unreasonably expensive access.

All new or reconveyed leases which carry the wilderness stipulation are governed by the IMP. This document states that any impacts must be non-impairing to wilderness characteristics, i.e. such impacts must be temporary, reclaimable and must not degrade to the point where it would affect the ultimate wilderness recommendation for the area. In practice, this restriction will generally impede oil and gas operations to the point of rendering them inaccessible. Operators accepting the conditions of such leases hope that the area they wish to lease will never be incorporated into the National Wilderness Preservation System.

The above restrictions remain in effect until Congress decides whether or not an area will be designated wilderness.

PREHISTORIC AND HISTORIC FEATURES

Through Section 2.Q (standard on all oil and gas leases) and a cultural resource stipulation (MSO 3100-47c) attached to all oil and gas leases issued from the Montana State Office, the oil and gas companies are committed to complying with cultural resource-related legislation, including the Antiquities Act of 1906, National Historic Preservation Act of 1966, National Environmental Protection Act of 1969, Archaeological and Historic Preservation Act of 1974 and the Federal Land Policy and Management Act of 1976. A commitment is also made to satisfy 36 CFR 60 and 36 CFR 800, regulations to enforce the National Historic Preservation Act of 1966.

MSO 3100-47c, the MSO standard stipulation, requires the area of operation to be inventoried for prehistoric and historic sites before construction in nonsensitive areas. The sites inventoried should be described in a report and appropriate mitigating measures applied. It further requires operations to be stopped if previously undiscovered cultural remains are found until appropriate action has been taken by the District Engineer, USGS.

Sensitive areas have been partially inventoried so prehistoric or historic sites are known within the cadastral section where oil and gas operations are proposed. Stipulation MSO 3100-47c should be added to the lease in addition to appropriate mitigating measures. Mitigating measures would probably require further inventories, avoidance of high-density areas or excavation of a site to recover the data it contains (after compliance with 36 CFR 800 if necessary, as shown in Appendix 2-2). The discovery of previously unknown features by the operator, requires the procedure outlined above for nonsensitive areas, including the stopping of ground-disturbing operations.

If the operator is unable to avoid an important cultural site, measures to fully comply with 36 CFR 800 must be taken (Appendix 2-2). Criteria for determining eligibility for the National Register of Historic Places must be applied. If the site is determined eligible by the Keeper of the National Register, the State Historic Preservation Officer has been consulted and the Advisory Council on Historic Preservation (ACHP) concludes that the oil

and gas operation will have an adverse effect, it is up to the BLM District Manager to decide whether or not to allow operations. The District Manager can require the applicant to avoid the area containing the site upon the advice of the ACHP.

Nonsensitive areas are thought to have fewer cultural resource sites, so they are generally uninventoried for prehistoric and historic features. This does not preclude the possibilities of stumbling over important sites, however. A sensitive classification does not prevent leasing, but requires the applicant to follow all sections of MSO 3100-47c—Inventoring, reporting and mitigating effects on cultural resource sites. Mitigation could follow three approaches to comply with 35 CFR 800: (1) if cultural resources are found to be present in the area of proposed operations, the applicant would be asked to move his operation to avoid the site; (2) if the site were found to be eligible for the National Register and the applicant could not move his operations, the problem would be treated as explained in the paragraph above; (3) if the applicant does not move his operation and the site can be salvaged by the recovery of data, the applicant would be required to remove the artifacts of the site in conjunction with an archeologist or historian. Sites discovered during oil and gas operations would be treated the same as for sensitive areas.

ECONOMIC AND SOCIAL CONDITIONS

(There are no commitments or additional enforceable measures that could aid in mitigating the social and economic effects of oil and gas operations. There are measures that can be taken, however. The primary impacts would be on communities called upon to provide services and housing to incoming oil and gas workers. Consequently, these impacts could be mitigated by hiring local labor whenever possible to reduce the population influx and by having oil and gas companies provide some services when practicable. The measures below would reduce social and economic impacts in direct proportion to the degree in which they are implemented.)

The training of local labor by the oil and gas companies to reduce the influx of people.

Providing temporary housing by the oil and gas companies in the form of trailer pads/hookups.

Company-sponsored medical care for workers.

LAND USE

The lessee must keep lands open at all reasonable times for the inspection of any duly authorized officer of the Department of the Interior.

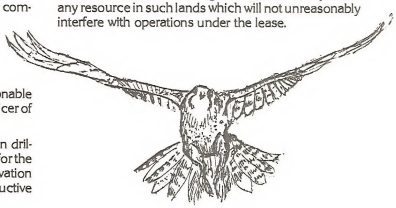
The lessee must exercise reasonable diligence in drilling wells and in production and have due regard for the prevention of waste of oil or gas and for the preservation and conservation of the property for future productive operations.

The lessee agrees to take such reasonable steps as may be needed to prevent operations on the leased lands from unnecessarily: (1) causing or contributing to soil erosion or damaging crops, including forage and timber growth thereon or on Federal or non-Federal lands in the vicinity; (2) polluting air and water; (3) damaging improvements owned by the United States or other parties or (4) destroying, damaging, or removing historic or prehistoric ruins or other cultural material. Upon any parties' total relinquishment, cancellation or expiration of the lease and to the extent deemed necessary by the lessor, the lessee is required to fill any pits, ditches and other excavations, remove or cover all debris, and so far as reasonably possible, restore the surface of the leased land and access roads to their former condition, including the removal of structures as and if required. The lessor may prescribe the steps to be taken and restoration to be made with respect to the leased lands and improvements thereon whether or not owned by the United States.

The lessee may be limited as to surface use or occupancy within certain special areas such as within 100 feet from the edge of the rights-of-way from highways, designated county roads and appropriate BLM-owned or controlled roads and recreation trails. The lessee may also be restricted by seasonal road closures, on roads for special uses, or on specified roads during heavy traffic periods and on slopes over 30 percent or 20 percent on extremely erodable or slumping soils.

The lessor reserves the right to permit for joint or several use easements or rights-of-way, including easements in tunnels upon, through or in the lands leased, occupied or used as may be necessary or appropriate to the working of the same or of other lands containing deposits described in the act, and the treatment and shipment of products thereof by or under authority of the Government, its lessees or permittees and for other public purposes.

The lessor reserves the right to lease, sell or otherwise dispose of the surface of the leased lands under existing law or laws hereafter enacted, insofar as said surface is not necessary for the use of the lessee in the extraction and removal of the oil and gas therein or to dispose of any resource in such lands which will not unreasonably interfere with operations under the lease.



2.4 Residual Impacts

Residual impacts are those that would remain after the mitigative measures listed in Section 2.3 have been applied.

CLIMATE AND AIR QUALITY

No residual adverse impacts from oil and gas activities on the macroclimate would be expected. Some effects on the microclimate would remain after abandonment and/or restoration of disturbed areas because of soil compaction and changes in water infiltration rates.

The mitigation of impacts on air quality would reduce, but not entirely eliminate, the adverse impacts from oil and gas operations. Some pollution from internal combustion engines, waste gas release and accidental fires or explosions might still occur.

GEOLOGY AND TOPOGRAPHY

No residual impacts would be expected for topography. Residual impacts to geological structures would be the same as those discussed in Section 2.1, "Geology and Topography."

SOILS

Overall residual erosion impacts would be moderate during drilling, road construction, pipeline construction and other surface disturbing activities. With the prescribed mitigating measures, the impacts might be reduced to slight within one year after rehabilitation.

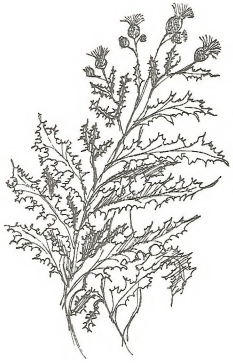
Oil spills might generally have little effect on soil erosion but the effects on vegetation could be more significant due to the biodegradability of crude petroleum. Spills of salt solutions, on the other hand, might cause longer periods of soil sterility with the potential of causing severe erosion on steep slopes.

There would be a possibility of localized, severe erosion due to oil or saltwater spills, improper construction or abandonment measures and unsupervised development. Such isolated incidences are expected to be rare.

VEGETATION

The permanent loss of native vegetation caused by the construction of roads and development facilities would occur. Recovery on other disturbed areas such as pipelines, seismograph trails, drill pads and drainage crossings might occur several years after abandonment.

Soil and habitat sterilization caused by acids or salts would partially or entirely remove vegetation in affected areas. Blowouts, fires and spills of caustic solutions could cause the significant loss of vegetation if large areas were affected.



Invader species and noxious forms of vegetation might replace native species on some disturbed sites if exposed to a seed source. The spread of invaders to off-site areas would have a negative effect on the composition of vegetation. The rehabilitation of the area and the seeding of native species suitable to the soils and climate would reduce the time required to replace the present plant composition if overrun by invader annuals and perennials. Despite weed control and rehabilitative seeding, noxious weeds would crop up in most areas in the Lewistown District.

The length of time required for restoration of native species would depend upon the composition of the vegetation disturbed. Grassland vegetation types could be restored rather quickly, so the negative impact would be short-term. Destruction of sagebrush and streamside brush and trees would create a long-term impact. Forest cover species could also be adversely affected by road and pad construction and pipelines. The length of time needed for rehabilitation, in this case, would be dependent upon the condition of the site.

WATER

Through enforcement of the recommended mitigating measures, sedimentation impacts would be reduced significantly. There is the possibility that revegetation might result in sediment yield rates that are less than before land disturbance in some instances.

Operations requiring stream crossings and activities on floodplains and near water could cause significant residual impacts during and immediately after surface disturbances. These impacts would be slight after one year of rehabilitation.

Measures to reduce the impacts on groundwater quality of oil and gas well construction and the drilling of seismic shot holes are included in both GS and Montana regulations. Because subsurface drilling, reinjection and plugging are regulated by GS, these impacts cannot be mitigated by BLM.

The Montana State Water Quality Bureau regulates the discharge of pollutants through a permit system (The Montana Pollutant Discharge Elimination System). The system controls significant point-source discharges by inspections to ensure compliance. Discharge of formation or treater waters from oil fields is regulated by this system. Consequently, residual adverse impacts on surface water quality from discharge waters should generally be slight.

The impact presenting the greatest hazard to surface water would be from accidents during oil and natural gas development and production stages. These could include oil spills, leaks, brine pit overflows and blowouts. Safety measures like protective dikes and standby cleanup equipment are required by Montana law and GS regulations. These measures reduce the impact both in terms of the volume and the length of the exposure to pollutants.

Unusual acts of nature might result in the failure of earthworks, mudpit and brine overflows and surface water runoff capable of transporting brine and oil to streams, lakes and wetlands.

ANIMALS

Most of the direct mortality to individual animals might still occur. The death of small animals from heavy equipment could be unavoidable. Vehicle-animal collisions and the illegal shooting of game and raptors, as well as indiscriminate shooting of other animals, would remain a possibility. Accidental spills of oil or other toxic substances might still happen, causing significant animal losses from polluted water sources.

The destruction of habitat that included important food and cover areas would affect various wildlife populations until adequate restoration occurred. If a game species were reduced, this would be reflected in a lower harvest to sportsmen. Big game and some other animals dependent on shrubs and trees for food or cover could suffer long-term losses, as these vegetation types do not recover quickly.

Habitat loss from permanent structures such as buildings and roads, would reduce available living space, either permanently or for a long period of time. No surface occupancy stipulations could significantly lower this loss. Allowing the industry to operate in any given area would often result in an adverse impact on one species while protecting another. Thus, some wildlife loss would undoubtedly occur, requiring a ranking of the importance of each species.

Oil and natural gas development and human activities would significantly affect species that are intolerant to such things. Ensuring that these activities are allowed only in the less important habitats or during non-critical periods of time would lessen this impact.

RECREATION

Impacts that diminish or eliminate hunting, fishing or the general enjoyment of the outdoors on public lands would be considered adverse to recreational values. These impacts are listed under the "Water," "Animals," "Aesthetics," and "Wilderness" sections of this document.

AESTHETICS

With proper reclamation, the long-term residual impacts could be minimal. The short-term impacts could also be minimized through the proper enforcement of stipulations, e.g. requiring painting or camouflaging structures. As mentioned above, this is most effectively done at the time of the prestake or predrill application since requiring such stipulations after a field is in production would involve additional coordination. It is more efficient for the operator to make all changes during the initial construction.

WILDERNESS

On pre-1976 leases, with the wilderness stipulation, BLM has no control over oil and gas operations beyond dictating access and preventing undue or unnecessary degradation of the area. Therefore, any of a host of possible impacts could occur.

Temporary impacts would mar the area visually until rehabilitation hid the scars of two-track trails, blast holes, litter and possibly even some drill pads. Traces would not be significant and would be easily removable.

Continued use of abandoned vehicle trails made during oil and gas operations pose the greatest hazard to wilderness as far as residual impacts are concerned. Use, especially in wet conditions, could result in roads being developed from barely discernable vehicle compaction tracks.

If the procedures outlined in Section 2.3 "Wilderness" are followed, no long-term impacts from oil and gas operations would affect wilderness values on leases carrying the wilderness stipulation. The process allows for the separation and protection of wilderness study areas from other public lands as a whole without disqualifying impairments.

PREHISTORIC AND HISTORIC FEATURES

Residual adverse impacts would be to those sites eligible for the National Register which were affected by oil and gas operations. These sites have potential for viewing and/or they are difficult to mitigate by the recovery of data. Damage or destruction to sites of this type would be a major unmitigatible impact.

Where features and sites could not be avoided, requiring the excavation of beneficial information would be gained but the sites could not be studied in the future with perhaps better methods. Thus, excavation would create a partial residual adverse effect.

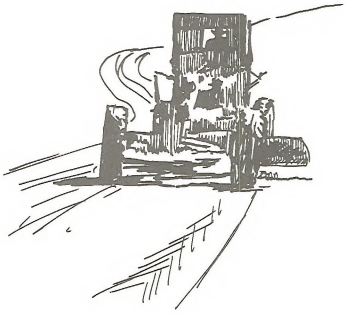
ECONOMIC AND SOCIAL CONDITIONS

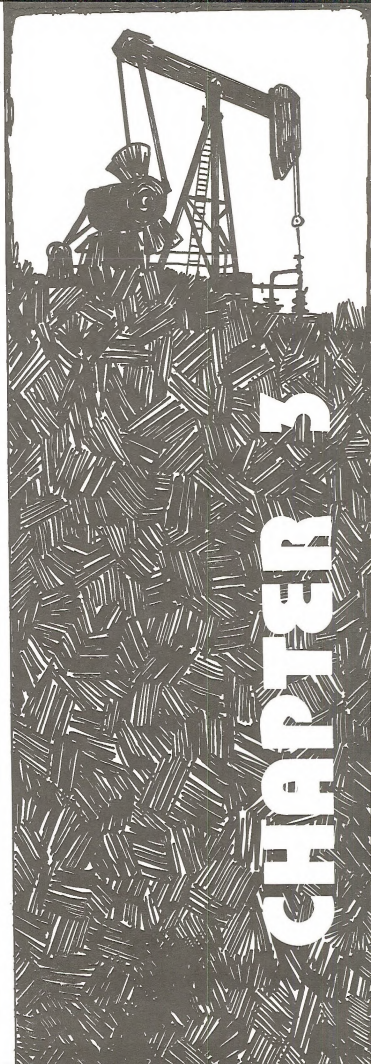
It is highly unlikely that a population influx from major oil and gas field development could be totally avoided. For this reason a community close to a major field would almost certainly experience some strain on public services as a result of immigration. Because the exact levels of development and the degree to which mitigating measures would be applied are unknown at this time, it is impossible to quantify the amount of residual adverse economic and social impacts.

LAND USE

If the lands associated with oil and gas activity are reclaimed they will become reestablished with native vegetation over time. The length of time required for the lands to develop the production capability they had before oil and gas operations is often so great (many decades to centuries), however, that this effect is considered a long-term residual impact.

Depending upon the number of developed wells in a given area, unreclaimed lands could cause a substantial loss in land productivity. For example, present regulations allow the development of one oil well for every 40 acres of land and one gas well for every 160 acres of land. Assuming that an average drilling site, including wells, pads, storage tanks, service roads, etc., would disturb an estimated 3 acres of land surface, then, at maximum development, the amount of productive land lost to oil development would likely approximate 48 acres per square mile (7 ½% of 640 acres), or about 22 acres per square mile (3 ½% of 640 acres) for lands developed for natural gas production.





ALTERNATIVE TO THE PROPOSED ACTION

Introduction

This chapter considers the potential impacts on the Lewistown District, the region and the nation of discontinuing oil and gas leasing on public lands. This alternative is called "No Action" in this EA. BLM's oil and gas leasing program could be discontinued in this alternative but it does not provide for setting lower levels of leasing on public lands. If leasing levels were increased or reduced the result would be similar to the impacts discussed but in a different degree. The No Action Alternative assumes that the Secretary of the Interior would exercise his authority to discontinue the leasing of Federal oil and gas resources in Montana and the Dakotas. It should be noted that although implementation of this alternative is unlikely, oil and gas leasing by BLM is discretionary and could be halted altogether if sufficient reason existed.

Leases to explore for oil and gas on public lands are normally granted for a period of ten years. If a strike is made during this time, the lease is renewed for the life of the field. Non-productive leases expire at the end of ten years whether or not exploratory drilling is complete. The No Action Alternative would prohibit oil and gas exploration on public lands and would take about ten years to implement, as an average of 10% of the non-producing leases expire in a given year. Thus, in 10 years, 100% of the non-producing leases would expire. Oil and gas companies would probably accelerate exploration on likely leases to get public land into production before the leases expired. Preliminary exploration, exploratory drilling and development on public lands would therefore increase until leasing were prohibited.

Immediate impacts of discontinuing oil and gas leasing on public lands would be: (1) the loss of some oil and gas supplies to Montana and the U.S.; (2) direct loss of employment and income for oil and gas workers from the exploration, development and production of oil and gas resources on public lands; (3) loss of economic production due to elimination of this energy source; (4) indirect (secondary) losses in employment and income; (5) loss of Federal oil and gas bonuses, rents, royalties and filing fees; (6) loss of 50% of these revenues to Montana; and (7) elimination of future surface disturbances on lands overlying Federal oil and gas resources as a result of leasing.

Specific impacts of this alternative on the various parts of the environment are discussed below.

CLIMATE AND AIR QUALITY

The banning of oil and gas exploration leases would have no affect on the climate of the district. Air quality around wells and along roads and trails would improve slightly if oil and gas exploration were prohibited.

GEOLOGY AND TOPOGRAPHY

Impacts from the No Action Alternative could be a greater dependence on coal to make up for the loss of oil and gas, perhaps causing more mining of public lands.

SOILS

Effects on soils from current, unexpired lease holdings would be the same as those described in Chapter 2.2. It is likely that more exploration on unexpired Federal leases could lead to greater soil-related impacts than at present. Impacts from geophysical operations would continue.

VEGETATION

Under this alternative, drilling would continue for an unknown period on leases currently producing oil or gas—perhaps for 20 years or more. Effects on vegetation would probably increase in areas with privately owned mineral rights as public lands were withdrawn from oil and gas leases. Impacts from geophysical exploration would continue even in the absence of Federal leasing.

WATER

This alternative could initially have a greater adverse impact on the water resources than the present oil and gas leasing. Exploration activities would increase on current leases as companies attempted to discover oil and gas before expiration. The effects of preliminary exploration, exploratory drilling and development discussed in Chapter 2.2 would probably increase substantially or become more concentrated prior to lease expiration.

Over a period of 8-10 years, exploration on current Federal leases would decline. Eventually, after all of the present leases expired, there would be no new impacts from exploration or development on lands with Federal mineral rights. Production would continue until oil and gas fields were abandoned. Hydrologic impacts from geophysical activity would continue in the absence of Federal leasing.

ANIMALS

Discontinuing Federal oil and gas leasing would create similar effects as those discussed in Chapter 2.2 but on a smaller scale. Current leases would be developed more rapidly, with the impacts continuing until abandonment. The impacts of oil and gas leasing would continue, however, assuming that mineral leasing and development occurred (possibly at an accelerated pace) on private and state-owned land. As many species of wildlife are mobile, a private oil and gas production area adjacent to public lands would affect all of the species in the general area.

If leasing did not occur, there would be no effects upon livestock using lands overlying Federal oil and gas estates.

RECREATION

If Federal leasing did not occur, there would be no effects on recreation beyond those associated with normal population growth.

WILDERNESS

This alternative would have a beneficial impact on wilderness values by eliminating the potential for disturbing the solitude and naturalness of the wilderness areas.

AESTHETICS

A slight contrast would be created if oil and gas leasing were prohibited on public lands or where publicly owned mineral rights were intermingled with large blocks of private and state-owned lands. Development could continue on the private and state land but not on the public. This contrast would be virtually unnoticeable because of the character of oil and gas fields and because the public lands would be scattered throughout a developed field. For these small parcels, the refusal to lease Federal oil and gas mineral rights would have a negligible effect on the appearance of the area as a whole.

A similar contrast would be created on larger blocks of public lands. The effect of these developments on public lands would be neutral except where publicly owned mineral rights were overlain with the surface owned either privately or by the state.

PREHISTORIC AND HISTORIC FEATURES

Geophysical operations would continue even in the absence of Federal oil and gas leasing so the impacts would be the same as those discussed in Chapter 2.2.

ECONOMIC AND SOCIAL CONDITIONS

In order to quantify some of the economic losses from the No Action Alternative, it is estimated that 185,000 acres of public lands in the Lewistown District are currently producing oil or gas, while 5,000,000 have been leased for these resources but are presently non-producing. (The acreages for public lands in the state are given in Table 3.1.) No Action would mean the expiration and non-renewal of oil and gas leases on 500,000 acres of public lands yearly for a period of ten years. At the end of this time, only leases actually producing would be allowed to operate on public lands.

Non-renewal of 500,000 acres of public land would mean the loss of $500,000 of leasing revenue (at the present rate of $1.00 per acre per year) to the Federal Government yearly. After all oil and gas leases expired, the loss would be $5,000,000 each year. Since 80% of public land has publicly owned mineral rights and 50% of the revenue from public lands is distributed to the state under the 1920 Mineral Leasing Act, Montana would lose $2,000,000 annually in revenue also (80% x 50% = 40% x $5 million = $2 million). Federal revenues would also be reduced by the losses of bonuses, rents, royalties and filing fees.

TABLE 3-1: FEDERAL OIL AND GAS LEASES UNDER PRODUCTION IN MONTANA AS OF 11/30/75

Mineral Ownership	ACTUAL PRODUCING No. of Leases	Acres	ALLOCATED PRODUCING No. of Leases	Acres	NON-PRODUCING No. of Leases	Acres	TOTAL No. of Leases	Acres	
Public	485	253,380	207	108,259	9,475	8,643,956	10,167	9,005,595	84%
Acquired	12	13,176	5	6,011	2,193	1,672,899	2,210	1,692,086	16%
Total	497	266,556	212	114,270	11,668	10,316,855	12,377	10,697,681	100%
Total by %	4%	2.5%	1.7%	1.1%	94.3%	96.4%	100%	100%	

Source: USGS Figures, National Resource Lands Digest, 1975-1976, BLM, MSO.

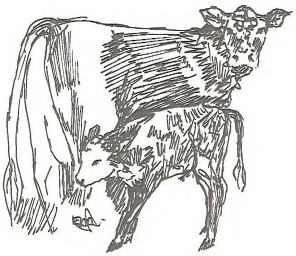
After 10 years, all Federal oil and gas leasing would cease under the No Action Alternative. This would adversely affect the oil and gas industry to some degree, but the severity of the impact is open to question. Most current production on public lands is from established fields which could operate until exhausted. Producing oil and gas leases could also be renewed for the life of production under this alternative. Fields brought into production before the ban took effect would also be exempt. Thus, the long-term effects of discontinuing oil and gas leasing on public lands would depend in some degree on the location of future oil and gas fields.

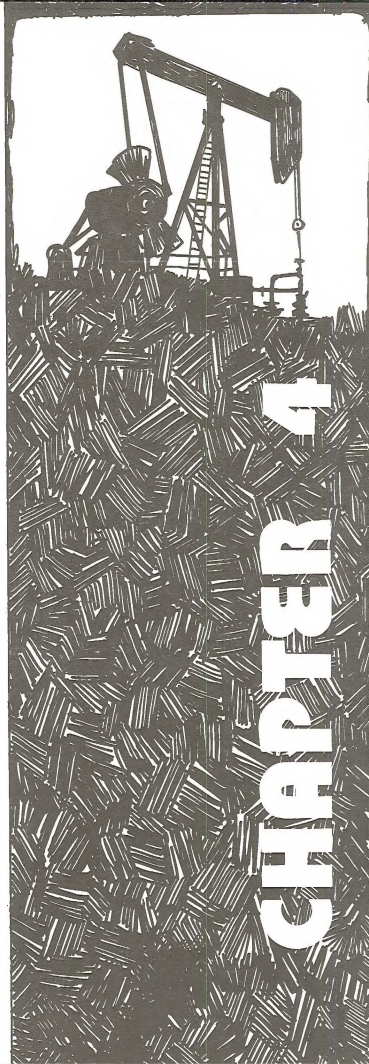
There would probably be effects on employment and income under this alternative but the nature and severity of the impacts would be problematic, depending on whether or not discontinuing Federal leases caused a drop in oil and gas operations. Hurrying leases into production before the prohibition took effect could increase employment and income as operators hired more workers for accelerated exploration and drilling. This increase could also affect the communities near the fields but the nature and degree are impossible to project.

LAND USE

This alternative would mean that BLM lands would be available for other public purposes such as agriculture and livestock production, wildlife and recreational uses. No oil and gas leasing by the Federal Government could affect leasing on private lands, in cases where surface ownership were necessary for efficient exploration and development.

Prohibiting oil and gas leases on public lands would not significantly affect BLM's policy of granting rights-of-way for energy related purposes. If the companies could provide the measures necessary to protect public resource values, rights-of-way for transportation and access would continue to be granted on a frequent basis; however, the demand for rights-of-way and ancillary uses would be less under the No Action Alternative.





AFFECTED ENVIRONMENT

Introduction

This section describes the physical, biological and cultural features in the Lewistown District by environmental component. Particular emphasis has been placed on features which would experience impacts from oil and gas activities. Figure 4-1 shows the locations of the features described.

If the reader is interested in more detailed information concerning these environmental components, he is encouraged to look at other planning documents of the district located in either the district office or one of the five resource area offices.

CLIMATE AND AIR QUALITY

The climate of the Lewistown District is typically mid-continental, ranging from semi-arid in the plains and intermountain basins to sub-humid in the mountains. The semi-arid areas have moderately low rainfall, great extremes in summer and winter temperatures, many sunny days and relatively low humidity. Midsummer temperatures are not oppressive because of the low humidity levels, and the harshness of winter is often tempered by warm winds.

Mountains exhibit more uniform temperatures, greater rainfall and a greater number of cloudy days than the plains. Rainfall normally increases and temperatures decrease in higher elevations. To some extent, mountain ranges and larger canyons influence air drainage and the paths of local storms; consequently, some areas are more subject to hail and frosts (both early and late) than others.

Mean and average annual temperatures vary with elevation. Temperatures in the high mountain basins are about 6 degrees (Fahrenheit) lower than those recorded on the plains. January is the coldest and July the warmest month with minimum and maximum temperatures of -60 degrees and 110 degrees, respectively, representing a range of 170 degrees.

The crops grown in the district are influenced by the average summer temperature and the length of growing season, both varying with elevation. The frost-free period ranges from about 90-145 days but killing frosts may occur during any month of the year.

Precipitation usually ranges anywhere from 12-16 inches yearly, with the highest precipitation occurring in the higher elevations. Isolated mountain ranges in the western part of the area have their own peculiar climates, depending on their elevation and exposure. Local showers are characteristic of much of the summer rainfall on both mountain and prairie areas; some areas may receive good rains and others a few miles away may receive none. The lowest average precipitation in the district of 6 inches occurs along the Montana-Wyoming border.

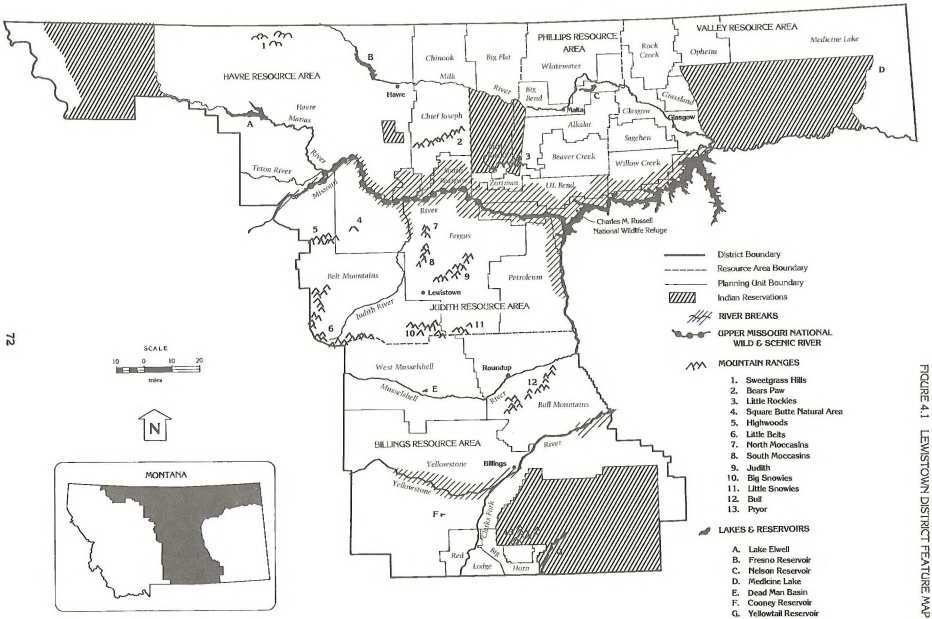


FIGURE 4.1 LEWISTOWN DISTRICT FEATURE MAP

SOURCE: BLM 1981

Part of the yearly precipitation falls as snow during fall, winter and spring. Snow rarely accumulates on the prairie as strong winds blow it into drifts on leeward slopes and into coulees. Throughout the district average snowfall varies from 40-120 inches.

Occasional severe hailstorms may occur anywhere in the district. The Upper Musselshell River basin and sections in the intermountain basins are somewhat more subject to hail damage than other areas.

Air quality is basically very high throughout the district. Except near the city of Billings, degradation occurs usually only on a local, short-term basis from construction, burning of grain stubble or logging slash, other agricultural activities or from natural causes such as range or forest fires. Areas near Billings, if in the pattern of air flow, receive the greatest influence from air pollution due to oil refineries, sugar beet processing, power generation and vehicular exhaust. Most of this pollution, however, is largely dissipated outside the periphery of the city.

GEOLOGY AND TOPOGRAPHY

Comprising all of central and part of eastern Montana, the geologic formations of the Lewistown District are largely sedimentary rocks. The bedrock strata are horizontal, or nearly so, over most of the area. In certain areas, though, the beds have been sharply tilted by uplifts which form the dome-type isolated mountain ranges typical of the border region between the Rockies and the plains. These ranges are the Pryor, Big Snowy, Highwood, Little Belt, Judith, Moccasin, Little Rocky and Bears Paw Mountains and the Sweet Grass Hills. The youngest beds on the surface are exposed in areas away from these mountains while outcrops in mountain areas commonly comprise deep-seated beds where erosion has removed the younger rock caps. In the lower 5,000 feet of sedimentary rocks are the Cambrian, Devonian and the Mississippian strata, composed mostly of limestone. Beds become sandy and shaley towards the middle of the Pennsylvanian sections. The uppermost 6,000 feet consists of interbedded shale and sandstone of Jurassic, Cretaceous and Tertiary age.

Igneous volcanic and intrusive rock form the central core of many of the isolated domes in central and north central Montana.

Most of the bedrock in the district is covered by unconsolidated rocks, including glacial moraine and outwash, terrace gravels and recent stream-deposited alluvium. The glacial drift deposits and the sand and gravel deposits of glacial outwash are in the areas once glaciated. Terrace gravels are the alluvial deposits of former river systems from mountains in central and western Montana during preglacial times. Recent sand and gravel deposited by present streams are found along all drainageways.

A generalized geologic section of sedimentary formations and their descriptions and thicknesses is contained in Appendix 4-1. Appendix 4-2 shows a cross section of a portion of central Montana.

The Lewistown District is situated on the extreme western part of the Great Plains but it has three distinct physiological regions—the plains, the river breaks and the mountains. The plains are the largest region. They are almost level to steeply rolling with small ridges. Slopes range from 1%-30%. Elevations range from 4,800 feet near the beginning of the Snowy Mountains to 2,800 feet at the beginning of the Missouri River Breaks.

The breaks are the second-largest region. They are an area of sharply incised coulees which divide low ridges. Slopes range from less than 5% on ridgetops and in coulee bottoms to 90% on side slopes. Elevations range from 3,800 feet on ridgetops in the Arrow Creek area to 2,176 feet at the high water mark of Fort Peck Reservoir.

Most of the large mountain ranges are administered by the U.S. Forest Service. Therefore, only the foothills, which contain BLM land, will be considered in this EA. Elevations range from 4,000 feet at the base of the Moccasins to 6,428 at the summit of Judith Peak in the Judith Mountains. Slopes range from almost level to in excess of 100%, averaging 50% or more.

Oil and Gas Occurrence

Drilled in Carbon County in 1897, the first oil well in the district was a dry hole. From this inauspicious beginning, the oil and gas industry of Montana developed. The first oil and natural gas wells were located on the basis of surface expression of subsurface features. Notable fields were discovered by surface structures that include the Sweet Grass Arch, Cedar Creek Anticline, Poplar Dome and Elk Basin. With the development of reflection seismography in the 1940's, the production of petroleum exploded, many new fields being opened since that time.

Petroleum occurs in 21 geologic formations, ranging in age from late Ordovician (Red River formation) to the upper Cretaceous (Judith River formation). Natural gas is found in 18 geologic formations from the Stony Mountain formation of late Ordovician age to the Cody Shale of the upper Cretaceous. Most oil and natural gas production is from Cretaceous formations.

SOILS

The soils in the Lewistown District differ greatly in character and productivity, largely because of their physical, chemical and biological properties and because the soils occur in different climatic zones. This discussion of soils is general in nature, being confined to broad, general soil subgroups that predominate in the district.

Soils here run from shallow, immature, heavy clay soils of low productivity in the Missouri, Musselshell and Yellowstone River Breaks to the deep, fertile and highly productive soils of the mountain meadows. Lands are mostly privately owned in the vicinity of the mountains and river bottoms, while public lands are found mostly in the breaks and prairie areas.

Adjacent to the mountains are found the alluvium soils, deep and medium textured, underlain by rounded gravel outwash. These soils grade from silty clay loam to a sandy loam. They are underlain by limestone gravel at varying depths up to 80 feet. When topography allows, alluvium and terrace soils are cultivated; the remainder is privately owned grazing land.

The breaks soils are characterized as thin, immature soils without definite horizons, retaining the platy structure of the parent shales. The poor soils and rugged topography of the breaks are the primary reasons the area is mostly public domain land. Breaks soils have developed over both the noncalcareous shales such as the Bearpaw, Claggett and Colorado, and calcareous sandstone and shale formations such as the Fort Union, Hell Creek, Fox Hills, Judith River and Eagle formations. Soils from noncalcareous shales vary from raw, immature, heavy clays with little or no structure to a clay loam with moderate structure.

The soils developed over calcareous sandstone vary from a silt loam to a medium sandy loam, with a top layer of 4-5 inches. These are frequently underlain with a silty clay loam. Calcareous soils are found in the broken sandstone escarpment areas of the central and eastern part of the district, adjacent to the mountains and in the areas north of Roundup.

Lighter and slightly better developed soils are found in the prairie areas between the breaks and the mountain foothills. These soils are marginal in productivity and are relatively immature, shallow soils with poor structure and a low humus content. These soils have been cultivated in the past but, because of their low productivity, were abandoned as cropland. Cultivation destroyed what little structure the soils had, and they were very susceptible to wind and water erosion until revegetated.

Detailed information on soils in the district is given in specific Unit Resource Analyses (URAs) on file in each BLM resource area office and in the district office.

VEGETATION

Terrestial Vegetation

Vegetation in the district is one of two types, falling into either the mixed-grass Prairie or the Rocky Mountain Coniferous Forest. Numerous vegetation subdivisions exist in each of these biomes, dictated by soil, aspect, climate, elevation and past land uses. Detailed descriptions of all vegetation types are presented in individual URAs in the district office.

In general, vegetation of the prairies falls into three broadly categorized zones: grassland, shrub-grassland (usually sagebrush) and conifer parkland of the Missouri Breaks and a few other sites. Within these zones, there is a mosaic of vegetation types based on specie dominance.

Shrub-grasslands comprise larger areas on public lands than the other two zones. Big sagebrush and western wheatgrass or thickspike wheatgrass are the most common dominant species combination.

Bluebunch wheatgrass and green needlegrass are the highest developed grasses, often being replaced with other plant communities. Other grasses include plains muhly, alkali sacaton, needleandthread grass, blue grama, prairie june grass, Indian ricegrass, little bluestem, Sandberg's bluegrass and others (see Appendix 4-3).

Silver sagebrush is commonly found on drainage bottom sites. On sandy sites, needleandthread grass replaces rhizomatous wheatgrass as the dominant grass. Saline sites have salt-tolerant species, including greasewood, Nuttall saltbrush, shadscale and winterfat. The dominant understory grass is saltgrass.

The grassland zone is made up of vegetation similar to the brush-grassland zone although a higher ground coverage of forbs may be present. A listing of forbs present in both zones is given in Appendix 4-3. The only shrub (actually classified as a half shrub) of any importance in grassland vegetation types is fringed sagewort.

The third zone includes the conifer-parkland areas of the Missouri Breaks, sites surrounding the town of Roundup, including the Bull Mountains, and areas adjacent to the Yellowstone River. These low elevation timber types have an overstory of ponderosa pine sometimes interspersed with Douglas-fir and Rocky Mountain juniper. On many sites the latter two species form pure stands. In the far southeastern end of the district, a Utah juniper-blacksage vegetation type occurs with curleaf mountain mahogony, an associated shrub species.

The Rocky Mountain Coniferous Forest type is found in higher elevation ranges such as the Snowies and Little Belts. These ranges are higher than the conifer-parkland zone and have additional and more distinct zones determined by the change in altitude. Conifer types include ponderosa pine (at the lower elevations), Douglas-fir and Englemann spruce-subalpine fir (at the higher). Lodgepole pine stands mixed with shrub communities are located throughout the Douglas-fir and spruce-fir zones. White bark and limber pine are found along dry ridges and slopes while quaking aspen groves are common in many locations, generally in sites with moderate amounts of moisture.

There is a little understory vegetation where overstory cover is dense. Oregon grape, thin-leaved huckleberry and kinnikinnick are most common types of understory plants. Elk sedge is usually the most common grass-like plant here. When the overstory cover is broken, a variety of grasses and forbs can be found. These include grasses such as wheatgrasses, bromes and Idaho fescue. Common forbs include heartleaf arnica, yarrow, clovers, asters as well as many others while shrubs may include rose and raspberry.

There are riparian areas throughout the district in vegetation types which vary from sparse, low-growth vegetation at high elevation headwaters to complex, wide strips of dense vegetation around major streams and rivers. Riverbank vegetation often includes an overstory of cottonwoods and willows.

Introduced vegetation in the region is primarily limited to species used in farming operations; however, some species used for grazing and hay production have an effect on public land management. Crested wheatgrass is one such species which was seeded on thousands of acres of Bankhead-Jones Act, lands acquired by the Federal Government following the drought of the 1930's.

Poisonous and noxious weed infestations are not extensive in the area but occur often enough to cause concern. Leafy spurge (a noxious weed) is the most significant species primarily because it is hard to eradicate. Other noxious species are usually found in scattered patches along roadways and other areas where surface disturbances have occurred or along natural water courses or irrigation ditches. Other noxious plants in the district are bindweed, cocklebur, broom

snakeweed and Canadian thistle. These are usually found in scattered patches along roadways and other places where there have been surface disturbances, and along water courses or irrigation ditches. Some poisonous plants found in the area are larkspur, lupine, death camas and milkweed. Greasewood is common on rangeland saline soils but is not considered a problem in the region. Prickly pear cactus is a significant nuisance species on rangeland throughout the region, especially on hardpan soils.

Two threatened and endangered plants that may occur in the Lewistown District are the Eriogonium lagopus and the Ropippa calycina.

Aquatic Vegetation

Aquatic vegetation follows a successional pattern. Annual weeds and mosses are the first to appear in wet areas followed by submergents and emergents. During periods of high rainfall where high water continues for several years, emergent aquatics may tend to disappear. Under normal conditions, emergents can overtake other aquatics and choke out potholes over a period of years but this is generally not a major problem in the district due to the short growing season. During long drought periods, all aquatic plants become sparse.

Common emergent species are spike-sedges, bullrushes, broadleaf cattail, arrowleaf, water plantain and smartweeds (Appendix 4-3). Major submergents in the district include pondweeds, American milfoil, aquatic buttercup and western waterweed.

Various algae and mosses also occur in aquatic environments throughout the district. Barnyard grass and foxtail barley are often present on the shorelines of potholes and reservoirs.

WATER

Surface Water

The Lewistown District is in the Missouri Water Resources Region which includes portions of the Milk River, Upper Missouri River, Yellowstone River and Bighorn River Basins. All surface water drains to the Missouri River. The major rivers in the Lewistown District are the Missouri, Yellowstone, Milk, Marias, Teton, Judith, Musselshell and Clarks Fork Rivers.

Reservoirs are common throughout the district. Some of the bigger ones are Fort Peck, Fresno, Nelson, Cooney, Tiber, Yellowtail and Deadman's Basin.

Streamflow depends largely on the amount of annual precipitation during the winter and spring months. Runoff from melting snow begins as early as March in the low elevations (April in the mountains) and is essentially over by July. Perennial streams continue to flow through the summer and may be swelled slightly by summer rains. As fall rains begin, another increase in flow occurs before the runoff freezes in the cold weather.

Mountain streams generally maintain flows throughout the year with their lowest flows coming in late winter. Streams of the plains and foothills are usually extremely low or dry in late winter and summer months. These streams rise to a peak flow rate during the spring because of the runoff from melting snow and rain. Their flows fall rapidly after the peak and any later increases are dependent on rains. Maps showing the approximate average annual precipitation and runoff for streams in the Lewistown District are available in the district office.

Streams generally carry good to excellent quality water in mountainous areas but water quality declines as the streams flow onto the lower plains. The higher quality streams are located in the central and extreme southern areas of the district where they carry low dissolved solids of calcium bicarbonate predominately. Lower quality streams in the plains and foothills generally carry the sodium sulfate and sodium bicarbonate solids.

The sediment yield of streams in the district varies with the geology, relief and vegetation in the watershed and the quantity of streamflow. Consequently, streams on the sedimentary plains which run over shales and soft sandstones produce large quantities of sediment.

Groundwater

An area of high plains broken by mountain ranges extends through the central part of the district. This area is underlain by water-bearing sandstone and limestone formations that outcrop in mountainous areas. Here they are recharged from precipitation and streams flowing over them. The local geologic structure is such that the buried water-bearing formations away from the mountains are often favorable zones for flowing artesian wells.

Most of the remaining area of the District is a high plain, deeply incised by the Missouri and Yellowstone Rivers and tributaries. The Fort Union formation and terrace gravels of Cenozoic age (such as the Flaxville formation) contain groundwater. These formations are underlain by aquifers in the Fox Hills, Judith River, Eagle and Kootenai formations of Mesozoic age.

Alluvial deposits along principal drainageways which are composed of silt, sand, gravel and cobbles are the most permeable aquifers in the district.

There is a general correlation between the quality of surface water and groundwater, reflecting the interconnection of these systems. Because of the intimate interaction with the rock, groundwater tends to be slightly poorer in chemical quality than surface water. Water in consolidated sedimentary rocks of Cenozoic and Mesozoic age also tends to be poorer in chemical quality than waters in alluvial deposits.

ANIMALS

The Lewistown District includes a variety of wildlife. Specialized animals are closely associated with a particular vegetation type while others are more adaptable. The scientific names of animals mentioned are given in Appendix 4-4. More detailed descriptions of habitats and their locations for each specific animal are given in Unit Resource Analyses filed at resource area offices.

Big Game

These species have the most public interest and are important to the economy of the district. Big game species in the district include Rocky Mountain elk, mule deer, white-tailed deer, pronghorn antelope, Rocky Mountain bighorn sheep, Rocky Mountain goat and black bear.

Elk are most often associated with timber habitats. In this district, they can be found in the Missouri Breaks, the Sweet Grass Hills and in the Bull, Snowy, Little Belt, Judith, Highwood and Bears Paw Mountains. BLM administered lands provide most of the habitat for these herds except for the Little Belt and Snowy Mountain populations which occupy lands managed by the U. S. Forest Service.

Few areas in the district do not support mule deer. They are found on low elevation sagebrush flats to high mountainous timbered areas. River bottoms, "breaks" and mountain foothills usually support the greater populations. Grasslands provide the poorest habitat, but mule deer will live on them if breaks in topography and some brushy draws are also present.

White-tailed deer are usually associated with the deciduous vegetation growing on bottom lands, often close to agricultural lands. Some healthy populations exist on mountain foothill areas, however, especially in the Snowy Mountains.

The best habitat for pronghorn antelope consists of open, rolling sagebrush-grasslands which describes much of the Lewistown District. Sagebrush and weeds are items essential in the year-around pronghorn diet. Antelope are present on much of this habitat type in the district.

Typical Rocky Mountain bighorn sheep habitat consists of rocky ledges and walls for escape cover, interspersed with open slopes. Two transplants of bighorn sheep have been made in the Missouri Breaks, the first being unsuccesful. The second has a remnant population remaining after a build-up and die-off. A similar success of transplanting bighorn sheep was repeated in the Pryor Mountains. Transplants of 79 animals in 1971 and 1974 have yielded a population of 10-20 animals. Relatively healthy populations exist in the Little Rocky Mountains.

Rocky Mountain goats inhabit broken, rugged mountainous terrain. They occur in the Big Snowy Mountains and Square Butte. Those inhabitating the Snowies are on lands managed by the Forest Service.

Black bears are present in a few isolated mountain areas east of the Continental Divide, including the Little Belt and Snowy Mountains. They occur in a variety of forest habitats.

Game Birds

Eight species of game birds are found in the Lewistown District; two species of upland grouse, two species of mountain grouse and four introduced species.

Upland birds in the district are sage and sharp-tailed grouse. Sage grouse are inseparably linked with their sagebrush-grassland habitat, depending on the leafy material of sagebrush and herbs for food that their thin-walled gizzards can process. Their winter diet is almost entirely of sagebrush, and sagebrush also provides cover from the inclement weather. Sharp-tailed grouse are abundant throughout mixed-prairie rangelands. The best habitat for them is found in the upper limits of drainages with stands of inter-mixed tree-shrub grasslands.

Blue and ruffed grouse are forest grouse species found in the district. Blue grouse are usually associated with Douglas-fir. Ruffed grouse inhabit denser cover of mixed conifer and deciduous trees and brush, and are often found along stream bottoms.

Exotic game birds are the ring-necked pheasant, Hungarian partridge and chukar partridge. Although native to North America, the wild turkey was probably not present in Montana but has been successfully introduced here.

The best pheasant habitat is made up of weeds, brush and trees for cover, and grain crops and weeds for food. Since extensive forests or grasslands do not provide habitat, most public lands are unsuitable unless adjacent to private agricultural lands. Hungarian partridge also require a mixture of cultivated and uncultivated land but make more extensive use of grasslands than pheasants. Public lands provide some important "Hun" habitat.

Chukar partridge are not numerous in Montana. The largest populations in the Lewistown District are found south of Billings. The habitat they prefer is semi-arid areas with steep, rocky topography and an abundance of cheatgrass.

Suitable wild turkey habitat consists of ponderosa pine forests in rugged terrain. Small openings, deciduous trees and brush and drainages add to the quality of the habitat. Turkeys are found in a number of places in the district including the Bull, Snowy, Judith and Moccasin Mountains as well as in the Missouri Breaks.

Waterfowl

The northern half of the Lewistown District is part of the best breeding area of waterfowl in North America, the Prairie Potholes Region. Approximately 20 species of ducks nest here, as well as a substantial nesting population of Canada geese. Waterfowl habitat has seriously declined through drainage, farming and urbanization throughout this breeding range, however. Small stock water reservoirs constructed by BLM, some with nesting islands, have somewhat compensated for this habitat loss. In addition to its importance as a waterfowl breeding area, the district serves as an important wintering area for large numbers of mallards. They use spring-fed streams, warm water drains and large rivers with open water.

Furbearers and Predators

Mink, beaver and muskrat are the principal furbearers harvested in the Lewistown District. All three are associated with water habitat. Mink are carnivorous, the other two being vegetarians.

Predators that might be observed on public lands in the district are the coyote, fox, weasel, badger, skunk, bobcat and raccoon. Coyotes have the largest population among predators, and have become economically important because of the value of their fur. Other more scarce predators that may be present on public lands are the cougar, lynx, wolf and black-footed ferret. The latter two are threatened and endangered species.

Nongame Animals

Nongame animals include small mammals, nongame birds, reptiles, amphibians and invertebrates.

Small mammals include the jackrabbit, cottontail rabbit, prairie dog, ground squirrel and many smaller rodents. Probably the most numerous rodent in almost all vegetation types would be the western deer mouse.

A variety of hawks, owls, falcons and eagles are present in the district. The reader is referred to Appendix 4-4 for a list of these raptors.

Numerous nongame birds occupy various habitats on public land. Some confine themselves to prairie habitats and others to forested habitats. Many will inhabit both types of habitats. The greatest concentrations of nongame birds are found in riparian areas. Almost all are seasonal and leave the area during the winter. Some of the more common nongame birds are listed in Appendix 4-4.

Reptiles are found in most vegetation types while amphibians are associated with aquatic environments. Reptiles found in the district include the prairie rattlesnake, bull snake and plains garter snake. Amphibians include toads, the leopard frog and the tiger salamander.

Invertebrates, especially insects, are found in many varieties and in large abundance in the summer months but are generally fewer in the winter. Mullusks, snails, worms and aquatic insects are important in the food chain and are a major food source for fish, birds, reptiles and amphibians.

Endangered and Threatened Species

Endangered wildlife species include the peregrine falcon, bald eagle, whooping crane, gray wolf, northern swift fox and the black-footed ferret.

The peregrine falcon and the bald eagle have bred throughout the district in the past, but no active aeries are known to exist today. Only a few sightings of the peregrine falcon are reported in Montana each year. The bald eagle, a recent addition to the threatened and endangered list, winters here, and large numbers concentrate along major river systems and large water bodies during early spring. The whooping crane migrates through the northeastern corner of the district in the vicinity of the Medicine Lake National Wildlife Refuge. The gray wolf can be found as an incidental transient. Several recent sightings have been reported in the Pryor Mountain range. Potential habitat for the northern swift fox exists in the prairie-grassland areas throughout the district. The black-footed ferret has not been observed on public lands in the district for years but there are numerous prairie dog towns here, possible habitat for the ferret and areas where populations could be planted.

Fish

Fisheries habitat in the district varies from the clear mountain streams and spring-fed creeks to turbid rivers and warm water reservoirs. Thus, the fish species present are varied.

There are sport fisheries for both cold water and warm water species. The less tolerant cold water species are mostly of the trout family, principally rainbow and brook trout. Rainbows have been successfully introduced in many reservoirs built by BLM while scattered, residual populations of native cutthroat trout have also been found in the district. Brown trout are plentiful in the lower extremities of the cold water fisheries. Mountain whitefish are also present in some of these waters.

Warm water species, some of which have been introduced in stock water reservoirs on public lands, include largemouth bass, northern pike, walleye, sauger and yellow perch. Rough fish, found principally in major rivers, include big mouth buffalo, carp and goldeye. Other river species are channel catfish and shovelnose sturgeon.

The behemouth paddlefish spawns in both the Missouri and Yellowstone Rivers in the district. It is of considerable interest for fishermen.

RECREATION

The principal form of recreation on public lands in the Lewistown District is hunting. Because of more private lands being posted to hunting, public lands (especially large parcels) are becoming more important to hunters. Good populations of both big game such as mule deer, elk and antelope and upland game birds like sharp-tailed and sage grouse inhabit public land.

The Lewistown District is somewhat unique in that there are varieties of both warm-water and cold-water fish on public lands here. Stream, river and impoundment fishing are available in the district to fishermen.

Other recreational activities on public lands are also popular, including touring, hiking, camping, boating and others. Fossil and artifact hunting, as well as rock hounding, have been popular pursuits in the past and spelunking is increasing in popularity. These pastimes depend on the proximity of towns to public lands.

Key recreational areas in the district include the Upper Missouri Wild and Scenic River, Yellowstone River and the Pryor Mountain Wild Horse Range. The Upper Missouri Wild and Scenic River has been recognized for its unique, irreplacable and nationally significant natural and cultural resources as it was included in the national wild and scenic river system in October 1976. That year saw some 15,000 visitor days of use, sportsmen coming from around the nation to use the river. It appears that this use is on the rise. The horse range also draws people from around the nation.

AESTHETICS

This section gives a general description of the scenery in the Lewistown District. The rating of the scenery in BLM's Visual Resource Management System is detailed in "Aesthetics," Chapter 2.2.

Public lands in the district are largely composed of rolling grassland or sagebrush-grassland interspersed with coulees and draws. This land has relatively low visual-resource values because the landforms, textures and colors become muted and take on a monotonous tone.

River valleys, such as the Milk, Yellowstone and portions of the Missouri, traverse the district in an east-west direction. These valleys contain visual resources in striking contrast to the surrounding prairies, acting in some ways like elongated oases. River valleys are for the most part either farmland or riparian zones, providing a great variety of color from spring through fall. Pumps, irrigation pipeline and farm machinery somewhat detract from the scenic values of the river valleys, however.

The most scenic parts of the district are the isolated mountain ranges. These ranges provide a tremendous visual contrast with the surrounding plains, so much so that they seem to be misplaced. Mountain ranges usually have a covering of conifers and aspens except where rock outcrops occur.

Other interesting visual aspects that break the monotony of the prairie are the breaks areas adjacent to the Missouri, Judith, Musselshell and Yellowstone Rivers. These breaks contain deeply incised coulees formed by erosion and are often covered with pine and juniper.

WILDERNESS

In the Lewistown District there are twelve units of about 184,739 acres that BLM's State Director has designated Wilderness Study Areas (WSAs). These units are located in the Pryor Mountains in the south-central portion of the state, in the Big Snowy Mountains south of Lewistown and along the Missouri River Breaks (see Figure 2-12).

These units will be studied through a process examining the long-term manageability of the areas as wilderness and which will compare wilderness values to the value of other multiple uses. The end result will be a recommendation to Congress about the wilderness suitability of the WSAs. Congress will have the final say as to which, if any, of these areas should be added to the National Wilderness Preservation System.

WSAs are protected by Congress from actions that would degrade their wilderness values until such time as that body has had an opportunity to determine their suitability. The continuing present mining and grazing uses and mineral leasing is mandated in the manner and degree as was customary on October 20, 1976. This is the date the Federal Land Policy and Management Act was passed.

The U. S. Forest Service manages the 904,500 acre Absaroka-Beartooth Wilderness, portions of which are in the southern part of the district. The U. S. Fish and Wildlife Service manages 2 wilderness areas, the 11,800 acre Medicine Lake Wilderness in the northeast portion of the state and the UL Bend Wilderness of 20,847 acres in the central part of Montana.

In addition, 6 Wilderness Study Areas of 80,130 acres in the Charles M. Russell National Wildlife Refuge are awaiting action by Congress. Likewise 2 Forest Service units, the 81,000 acre Middle Fork of the Judith and the Big Snowies of 91,000 acres, are being evaluated for wilderness suitability as ordered by the 1972 Montana Wilderness Bill. The 10,800 acre Lostwater Canyon area in the Pryor Mountains is awaiting Congressional action as are two U. S. National Park Service proposals, 917,600 acres in Glacier National Park and 7,645 acres in the Bighorn NRA. Either all or parts of these areas are in the Lewistown District.

PREHISTORIC AND HISTORIC FEATURES

Prehistoric Resources

There is prehistoric evidence of man's occupation of most of the district through all of prehistory, although the evidence is scattered and the density of sites is variable. The Lewistown District files summarize the

number and types of sites assignable to each prehistoric culture period. Because the artifacts identified or collected from the surface often are not sufficient proof of a culture period, however, many sites cannot be labeled with a culture period affiliation. If these sites were excavated to recover subsurface materials, many would definitely be tied to one of the three culture periods discussed below.

Prehistory includes three general culture periods: Paleo-Indian (10,000 -5500 B.C.), Plains Archaic (5500 B.C. - A.D. 500), and Late Prehistoric (A.D. 500 - A.D. 1800). During all three periods, living on the Northwestern Plains involved hunting game and collecting wild plant foods. Because of this, the groups of people were quite small, had no permanent settlements and therefore possessed only a limited toolkit composed principally of stone, wood and bone objects. (At least, those objects likely to be preserved in an archaeological site are of these materials.) Most prehistoric sites in the plains are small and contain only limited numbers of artifacts and faunal or vegetal materials used as food because of these factors. Older sites are more likely to have been destroyed by erosion and other elements, making sites from the Paleo-Indian Period the most rare in the district while sites from the later periods are the most common.

Approximately 2,000 prehistoric sites have been recorded in the Lewistown District. Figure 2-14 shows the areas where the sites are most concentrated determined from present inventories.

Prehistoric site types in the district are classified according to their uses or functions which are determined from the features, artifacts and other cultural debris present. The functional types are: (1) habitation, (2) procurement, (3) industrial and (4) ritual. Habitation sites consist of cultural features and material which indicate everyday domestic activities such as manufacturing clothing, tools and ornaments, preparing food and medicine, cooking and securing warmth and shelter. Camp debris scatters, hearths, cairns and tipi rings comprise the features and material of habitation sites. Procurement sites consist of features representing specific activities for subsistence such as hunting bison, deer or antelope and gathering wild plants. Buffalo jumps, traps or pounds and associated processing areas are the most typical procurement sites in the Lewistown District. Industrial sites are made up of scatters of lithic waste debris, hammer stones, rough or damaged tools and chunks of workable fine-grained rocks. Quarries and workshops located around source materials are the common industrial sites. Ritual or ceremonial sites in the district may consist of petroglyphs, pictographs, burials, medicine wheels and rock or wooden structures which might have been used as war lodges, shaman quarters or vision quest features.

Cultural resource inventories in the district have found prehistoric features of varying significance. The significance of a site is generally measured by the information the site provides to the knowledge of prehistoric life in the area and what caused that pattern to change through time. Another factor in establishing the significance of a site is by the potential the feature may have for public enjoyment and education. Most of the 1,000 sites recorded in the district have not been investigated thoroughly enough to establish their relative significance. The scarce site types, such as animal kill and butchering sites, burials, rock shelters, pottery sites and some lithic scatters should be considered highly significant because of their obvious potential to yield cultural information. Although the majority of lithic scatters and tipi rings are more common, they too may contain information important to interpreting prehistory. The proper evaluation of most of these sites can be made only after they are better understood through improved archaeological methods and testing for subsurface cultural deposits. None of the prehistoric properties recorded have been completely studied for their public enjoyment and education potential.

Historic Resources

Historic sites are important because they can add substance to the historic record and for interpretation and public enjoyment. Some of the sites may also be significant to cultural studies in the same way as prehistoric sites are.

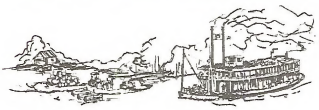
Approximately 300 historic sites have been recorded in the district. Many more are thought to exist as indicated in the historical summary for the district. Known sites on public lands have been recorded in BLM sampling inventories and planning efforts, and surveys by the state of Montana.

The earliest recorded historical events in the area were explorations by Europeans or Americans at the end of the 18th and beginning of the 19th centuries. Presently known records do not show that either British or French explorers entered the area, but the Lewis and Clark expedition of 1804-1806 traveled along the Missouri and Yellowstone Rivers and camped several times in the district. Coming up the Missouri River in 1805, the Lewis and Clark party camped at several times here and Captain Lewis' contingent passed through the same area on the return trip in August 1806. The Yellowstone River Valley was the scene of a few campsites from Clark's 1806 return trek.

Organized fur traders followed the Lewis and Clark Expedition to the Yellowstone and Upper Missouri country. Most of the activities from this trade in the district were confined to a narrow corridor along the two major rivers between 1820-1860. Trading posts or forts in the district were built on the Missouri and Yellowstone Rivers, but the locations of most of the posts are only vaguely known. Future surveys may locate cultural resources related to the sites.

By the 1860's the fur trade was declining, but there was a great demand for transportation to the gold fields in western Montana. Steamboats met some of this

demand. The first steamboat reached Fort Benton in 1859, and the head of navigation on the Missouri became a staging location for the travel of people and the shipping of goods to and from the gold fields. The use of the Missouri as a major transportation route brought more people into certain areas along the river downstream from Fort Benton. These include steamboat landings, discharge points for passengers and freight during low water and woodhawkers' locations, where fuel was provided to the passing steamboats.



Gold-seekers and the people that lived from them came into greater conflict with the native American Indian population as the push west continued. The period from the discovery of gold in Montana to the late 1880's saw military actions in Montana, and left historic features in the district. These include camps, posts, forts and battle sites. The three major conflicts with Indians were the Blackfeet War of 1869-70; the attempted Nez Perce flight to Canada under the leadership of Chief Joseph (1877); and the war with the Sioux (the Battle of the Little Bighorn, the Battle of the Rosebud, and several other sites of skirmishes are all in the district).

In the late 1880's the Great Northern and Northern Pacific Railroads were built through Montana. Between 1900-1925, the Great Northern built feeder lines and the Chicago, Milwaukee, St. Paul and Pacific (the "Milwaukee Road") built into the district, principally in the Lewistown area but also in other areas south of the Missouri River, and as far north as Winifred and as far east as Winnett. Abandoned tracks and the remains of structures and construction camps still litter the district.

The district was settled very slowly and remains sparsely populated even today except as noted below. Following the cessation of the Indian wars and the annihilation of the great buffalo herds, cattle and sheep ranchers moved into north-central Montana. The initial operations were large, with thousands of head of livestock and a few ranch headquarters.

After the disastrous winter of 1886-87 cattle operations declined, centering around the river valleys where hay could be raised to provide supplemental feed in the winter. Most of the ranch headquarters of this era were located in the most attractive areas for ranching and today are private land holdings. Major features located on public lands are likely to be more ephermeral things, such as corrals, sheepsheds, line camps and sheepherders stone piles. Like the overland freight trails of the steamboat era, these features are not well documented and are more likely to be discovered by systematic ground inventory than by record searchers.

Gold and silver were mined at several places after 1880 in the district and several boom towns were created, lasting in some places until about 1915. Most of the old mining camps are not completely ghost towns still having a few residents. Many historic buildings and features remain in them, though.

Changes in the Homestead Act and promotions from the railroads helped create the last major influx of people into the district. With the promise of dry farming techniques, many people took up 160, 320 or 640 acre homesteads between 1910-1925. Because the Homestead Act required it, homes and outbuildings were put up on most homesteads. Since the amount of capital commanded by most homesteaders was small, however, many of the buildings were tarpaper shacks or of sod though some were of logs. The early promise of dry farming did not prove out as droughts came, combined with falling agricultural prices after 1918. Later, with the nationwide depression of the 1930's, many homesteads were abandoned. In 1937 the Bankhead-Jones Farm Tenant Act passed to provide for the repurchase of some homesteaded land by the Government. Historic features from the homestead era may still be seen throughout the district.

ECONOMIC AND SOCIAL CONDITIONS

The Lewistown District is mainly small rural communities with agricultural backgrounds and economies. Rural and undeveloped lands of a natural character comprise most of the area. All counties in the district are sparsely populated except for Yellowstone County which includes Billings. Population densities range from 1.6 persons per square mile in Phillips County to 33.1 in Yellowstone County, compared with a national average of 59.0 persons per square mile.

In the towns scattered throughout the district, populations range from 200 - 10,000 people. Good highways provide the people of these towns with easy access to public lands. Leisure pursuits are generally related to outdoor types of activities so public lands play a large role in the leisure hours of many residents.

Towns like Glasgow, Malta, Havre, Lewistown and Roundup act as trading hubs for their areas. Geared to farm and ranch economies, these towns usually have machinery and implement dealers, hardware and general merchandise stores. Professional services are also available, including medical and dental care, legal advice, accounting and other professional services.

Communities in the Lewistown District were studied to determine the adequacy of their basic facilities and their overall capacity to absorb the additional people that oil and gas operations might bring in. These findings can be found in Appendix 4-5.

LAND USE

The Lewistown District encompasses 30,918,933 acres, of which 3,961,933 acres (13%) are public land administered by the Bureau of Land Management, 2,407,000 (8%) acres are state land and 24,550,000 (79%) acres are private land.

Ownership Patterns

Public lands are scattered throughout the five resource areas which make up the Lewistown District. Private and state lands are usually mixed with public lands. The private lands are generally those which are best suited for crops and the higher quality grazing lands. Those areas with suitable topography, soils and adequate water supplies were homesteaded and subsequently patented. The state lands were basically acquired as school support sections and since that time the state acquired additional lands through exchanges and sales.

Ranching

A large portion of public lands are used for livestock grazing. Private and state lands which are intermingled throughout the public land are used similarly. Allotment Management Plans are developed to manage grazing on public lands in conjunction with state and private lands.

Farming

Those lands suited for agricultural uses are largely in private hands as mentioned. Any public lands suitable for agricultural uses are usually designated as LU (Land Utilization) lands. These were homesteaded at one time with the intention of becoming patented lands but many tracts were purchased back by the U. S. Government under the Bankhead-Jones Act when they proved unproductive.

Most farming is of the dry land farming type. In areas where there is adequate water, irrigation systems are often employed. Irrigated areas include lands adjacent to the Milk, Yellowstone, Missouri and various other smaller rivers and drainages. Crops which are produced in the area include small grains, sugar beets and hay.

Roads and Highways

The Lewistown District is accessible by numerous Federal, state, county and privately owned roads. Major road systems include U. S. Highways 2, 87, 191 and 12, and U. S. Interstate 90. Federal, state and county roads provide public access, but permission must be obtained to use private roads. Roadway surfaces vary from the paved interstate to two-tracked, four-wheel drive trails.

Railroads

Railroads service a large portion of the district with freight and limited passenger service. Burlington Northern is the major freight carrier while Amtrack furnishes the passenger service. The railroads are important as they transport a large amount of agricultural products from the remote areas in the district to the larger markets. Goods and equipment required by agricultural areas are also transported via the railroads.

Pipelines

Many pipelines, both crude oil and natural gas, are located in the district (see Figures 1-26 and 1-29). These lines transport petroleum products to refineries in the state as well as shipping products in and out of Montana.

Powerlines

Power transmission lines cross the district in many locations, providing power for various needs. Distribution systems have been established from transmission systems to furnish power to residents, business, industries and oil and gas fields. Electricity-powered pumps and various other items of equipment associated with the oil and gas well sites which are dotted throughout the district.

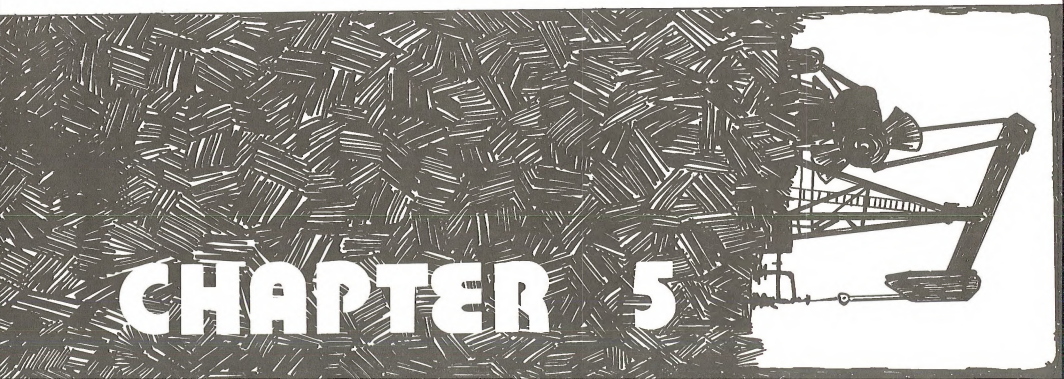
Residential/Commercial/Industrial

The major communities in the study area are Billings, Lewistown, Malta, Havre and Glasgow.

Billings is the largest city in Montana with a population of approximately 65,000. Several industries are located there: several large oil refineries, sugar beet refining plant, meat packing plant and livestock sales yards. Much of the oil and natural gas removed from the district's fields are processed in Billings. Billings also meets many of the goods, services and professional needs of the area. The other communities mentioned above are smaller and offer goods and services to agriculture and the oil and gas industry on a smaller scale.

Timber

Timber production from public lands is very limited in the district due to the general availability of other stands which can produce commercial timber. The Lewistown District harvests approximately a million board feet annually with most of the harvest occurring in the Little Snowy Mountains and the foothills of the Beartooth Mountains. The U. S. Forest Service manages most of the harvestable timber lands in the area, principally in the Little Belt Mountains.


CHAPTER 5

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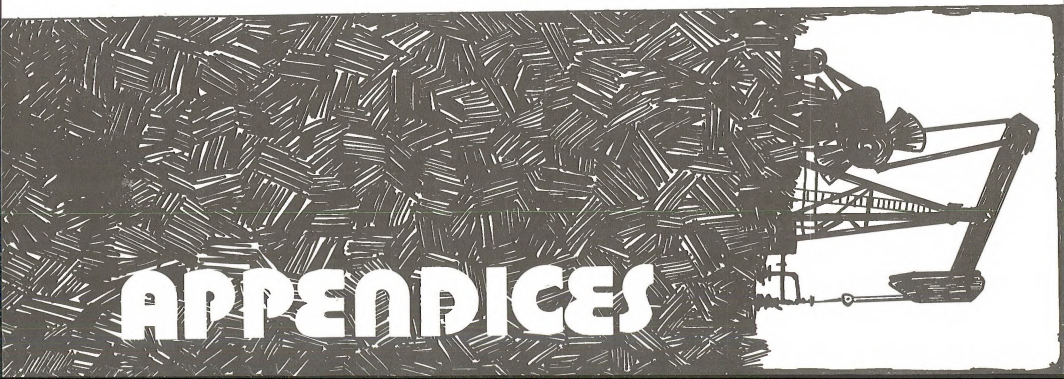
APPENDICES

APPENDIX 1-1: ASSUMPTIONS AND GUIDELINES

Because this assessment considers the possible exploration, development and production of oil and gas from Federal leases, it is necessary to outline several of the physical/operational characteristics which can be expected of the average drilling facility in Montana and the Dakotas. For analytical purposes, the assumption is made that any leasing action can result in oil and gas production, although historically only a small percentage of leases issued have gone into the production stage. Below are assumptions and guidelines which will be useful in the analysis of potential impacts resulting from oil and gas development.

Technology

For purposes of this analysis, it is assumed that the technology of oil and gas production will not change significantly. This assumption may not be objectively valid, but it is difficult to determine what direction improved technology may take in the future.

Supply and Demand

Many factors significantly affect oil and gas activity in the study area. For instance, demand for domestic oil and gas may decrease due to development of new energy sources. Alternatively, it may increase because of export restrictions imposed by foreign oil and gas suppliers or because of import restrictions imposed by the U. S. It is possible that a major oil or gas field could be discovered in the study area, resulting in increased activity. Since there is no way to accurately predict these changes, it is assumed that supply, demand and production activity will follow current trends.

Preliminary Exploration

Preliminary exploration activity is expected to increase at a rate of about 10% a year, with most of it in the deep formations. Exploratory drilling is expected to increase at a rate of about 15% a year, in response to an increasing demand for petroleum products. Drilling is expected to be in the deep formations and on the fringes of existing fields. Development is expected to continue at about the current level as existing fields are further exploited. Production has decreased at about 2% annually over the last several years as reserves have been depleted, and it is anticipated that this trend will continue during the short-run. Abandonments are expected to increase at a rate of about 5% a year as older fields are depleted.

Land for Producing Facilities

Land-use intensity decreases as well-spacing increases. The land use by all facilities in a developed field may range from more than 64 acres per square mile, with a 40-acre-per-well spacing, to about 4 acres per square mile with 640-acre-per-well spacing. These acreages are adequate for most field operations. The amount of land actually used may be greater in some areas and less in others. Most spacing patterns for oil wells on Federal leases require a minimum of 40 acres per well.

Land use in gas fields is usually less than in oil fields because gas production usually does not require storage on the lease. Most patterns for production of gas on Federal leases require spacing of 160, 320 or 640 acres per well.

Employment

The number of people required to operate a field varies with production and the number of leaseholds in the field. If the wells flow without pumping, one employee in a large, automated field can control production of about 25 wells. When wells are pumped, one employee in a large modern field can control production on 10 to 20 wells. If oil storage tanks are manually gauged and sampled, one employee can service approximately 25 tanks. If automatic gauging and sampling devices have been installed, one person can service the equivalent of 100 to 150 tanks. In a large, modern field, one five-man maintenance crew can service up to 50 wells. If the field contains many small, non-utilized leaseholds, more people will be needed to control production and maintain facilities.

UNITED STATES DEPARTMENT OF THE INTERIOR
Bureau of Land Management

(Serial Number)

OIL AND GAS LEASE STIPULATIONS

CULTURAL AND PALEONTOLOGICAL RESOURCES — The Federal surface management agency is responsible for assuring that the leased lands are examined to determine if cultural resources are present and to specify mitigation measures. Prior to under-taking any surface-disturbing activities on the lands covered by this lease, the lessee or operator, unless notified to the contrary by the authorized officer of the surface management agency, shall:

1. Engage the services of a qualified cultural resource specialist acceptable to the Federal surface management agency to con-duct an intensive inventory for evidence of cultural resource values;

2. Submit a report acceptable to the authorized officer of the surface management agency and the District Engineer, Geological Survey; and

3. Implement mitigation measures required by the surface management agency to preserve or avoid destruction of cultural resource values. Mitigation may include relocation of proposed facilities, testing and salvage or other protective measures. All costs of the inventory and mitigation will be borne by the lessee or operator, and all data and materials salvaged will remain under the jurisdiction of the U.S. Government as appropriate.

The lessee or operator shall immediately bring to the attention of the District Engineer, Geological Survey, or the authorized officer of the Federal surface management agency any cultural or paleontological resources or any other objects of scientific interest dis-covered as a result of surface operations under this lease, and shall leave such discoveries intact until directed to proceed by the District Engineer, Geological Survey.

ENDANGERED OR THREATENED SPECIES — The Federal surface management agency is responsible for assuring that the leased land is examined prior to undertaking any surface-disturbing activities to determine effects upon any plant or animal species, listed or proposed for listing as endangered or threatened, or their habitats. The findings of this examination may result in some restrictions to the operator's plans or even disallow use and occupancy that would be in violation of the Endangered Species Act of 1973 by detrimentally affecting endangered or threatened species or their habitats.

The lessee/operator may, unless notified by the authorized officer of the surface management agency that the examination is not necessary, conduct the examination on the leased lands at his discretion and cost. This examination must be done by or under the supervision of a qualified resources specialist approved by the surface management agency. An acceptable report must be provided to the surface management agency identifying the anticipated effects of a proposed action on endangered or threatened species or their habitats.

ESTHETICS — To maintain esthetic values, all surface-disturbing activities, semipermanent and permanent facilities may require special design including location, painting and camouflage to blend with the natural surroundings and meet the intent of the visual quality objectives of the Federal surface management agency.

EROSION CONTROL — Surface disturbing activities may be prohibited during muddy and/or wet soil periods. This limitation does not apply to operation and maintenance of producing wells using authorized roads.

CONTROLLED OR LIMITED SURFACE USE STIPULATION — This stipulation may be modified when specifically approved in writing by the District Engineer, Geological Survey, with concurrence of the Federal surface management agency. Distances and/or time periods may be made less restrictive depending on the actual onground conditions. The prospective lessee should contact the Federal surface management agency for more specific locations and information regarding the restrictive nature of this stipulation.

The lessee/operator is given notice that the lands within this lease may include special areas and that such areas may contain special values, may be needed for special purposes, or may require special attention to prevent damage to surface and/or othe resources. Possible special areas are identified below. Any surface use or occupancy within such special areas will be strictly controlled or, if absolutely necessary, excluded. Use or occupancy will be restricted only when the Geological Survey and/or th surface management agency demonstrates the restriction necessary for the protection of such special areas and existing or planned uses. Appropriate modifications to imposed restrictions will be made for the maintenance and operations of producing oil and gas wells.

After the Federal surface management agency has been advised of specific proposed surface use or occupancy on the leased lands, and on request of the lessee/operator, the Agency will furnish further data on any special areas which may include:

100 feet from the edge of the rights-of-way from highways, designated county roads and appropriate federally-owned or controlled roads and recreation trails.

500 feet, or when necessary, within the 25-year flood plain from reservoirs, lakes, and ponds and intermittent, ephemeral or small perennial streams; 1,000 feet, or when necessary, within the 100-year flood plain from larger perennial streams, rivers, and domestic water supplies.

500 feet from grouse strutting grounds. Special care to avoid nesting areas associated with strutting grounds will be exercised during the period from March 1 to June 30. One-fourth mile from identified essential habitat of state and federal sensitive species. Crucial wildlife winter ranges during the period from December 1 to May 15, and in elk calving areas, during the period from May 1 to June 30.

300 feet from occupied buildings, developed recreational areas, undeveloped recreational areas receiving concentrated public use and sites eligible for or designated as National Register sites.

Seasonal road closures, roads for special uses, specified roads during heavy traffic periods and on areas having restrictive off-road vehicle designations.

On slopes over 30 percent, or 20 percent on extremely erodable or slumping soils.

Date

Lessee's Signature

MSO 3100-47c (April 1981)

UNITED STATES DEPARTMENT OF THE INTERIOR
Bureau of Land Management Serial No. _____

Oil & Gas Lease Stipulations

The following stipulations may be modified when specifically approved in writing by the District Engineer, U.S. Geological Survey with the concurrence of the authorized officer of the surface management agency.

No Surface Occupancy Stipulation

% of Lease

( ) No occupancy or other activity on the surface of the following described lands is allowed under this lease: ( )
(a)

(b)

Reasons for this restriction are:
(a)
(b)

Surface Occupancy Restriction Stipulation (by location)

% of Lease

( ) No _____ will be allowed within: ( )
_____ feet of _____ located within:

_____ feet of _____ located within:

_____ feet of _____ located within

_____ feet of _____ located within:

This area contains approximately _____ total acres

Surface Occupancy Restriction Stipulation (timing)

% of Lease

( ) (a) In order to (minimize) (protect) _____ ( )
_____ will be allowed only during: _____

(b) In order to (minimize) (protect) _____
_____ will be allowed only during: _____

This does not apply to maintenance and operation of producing wells and facilities. Lands within the leased area to which this stipulation applies are described as follows:
(a)

(b)

Road Use Stipulation

% of Lease

( ) The _____ ( )
will not be used as an access road for activities on this lease except as follows:

_____ _____
Date Signature

MSO 3100-55 / January 1981

UNITED STATES DEPARTMENT OF THE INTERIOR
Bureau of Land Management

(OG SIM Serial No.) (Serial Number)

SPECIAL OIL AND GAS LEASE STIPULATIONS

The following special stipulations may be modified when specifically approved in writing by the District Engineer, Geological Survey with concurrence of the Federal surface management agency.

(Only stipulations checked apply to this lease.)		(Approximate % of lease affected by stipulation.)
( )	No occupancy or other activity on the surface of the following-described land is allowed under this lease: Reasons for this restriction are:	( )
( )	No occupancy or other surface disturbance will be allowed within _____ feet of the _____	( )
( )	No drilling or storage facilities will be allowed within _____ feet of _____ located in _____	( )
( )	No occupancy or other surface disturbance will be allowed on slopes in excess of _____ percent.	( )
( )	In order to _____ exploration, drilling, and other development activity will be allowed only during the period from _____ to _____. This limitation does not apply to maintenance and operation of producing wells and facilities. Lands within the leased area to which this stipulation applies are described as follows:	( )
( )	The _____ will not be used as an access road for activities on this lease except as follows:	( )

Date Lessee's Signature

MSO 3100-45 (January 1981)

[4310-10-M]

Title 36—Parks, Forests, and Public Property

CHAPTER VIII—ADVISORY COUNCIL ON HISTORIC PRESERVATION

PART 800—PROTECTION OF HISTORIC AND CULTURAL PROPERTIES

Amendments to Existing Regulations

AGENCY: Advisory Council on Historic Preservation.

ACTION: Final amendments to regulations.

SUMMARY: These regulations implement Section 106 of the National Historic Preservation Act 1966, as amended (16 U.S.C. 470), and two Presidential directives issued pursuant to Section 106—Executive Order 11593, May 13, 1971, "Protection and Enhancement of the Cultural Environment" (36 FR 8921, 16 U.S.C. 470), and the President's Memorandum on Environmental Quality and Water Resources Management, July 12, 1978. The regulations have been amended to reflect changes and additions to the Council's authorities, as well as experience gained in working with the process since the last publication of regulations in 1974. These amendments are intended to expedite and clarify the consulting process required by Section 106 of the National Historic Preservation Act.

EFFECTIVE DATE: March 1, 1979.

FOR FURTHER INFORMATION CONTACT:

John M. Fowler, Acting General Counsel, Advisory Council on Historic Preservation, 1522 K Street, NW, Washington, D.C. 20005, 202-254-3967.

SUPPLEMENTARY INFORMATION:

BACKGROUND

The Advisory Council on Historic Preservation is publishing these final amendments to its existing regulations to implement Section 106 of the National Historic Preservation Act, as amended (16 U.S.C. 470f). The purpose of Section 106 is to protect properties included in or eligible for inclusion in the National Register of Historic Places through review and comment by the Council on Federal undertakings that affect such properties. Properties are listed on the National Register or declared eligible for listing by the Secretary of the Interior. As implemented through these regulations, the Section 106 process is a public interest process in which the Federal agency proposing an undertaking, the State Historic Preservation Officer, the Council, and interested organizations and individuals participate. The process is designed to assure that alternatives to avoid or mitigate an adverse effect on a National Register or eligible property are adequately considered in the planning processes. The regulations are binding on all Federal agencies and specify the manner in which the Council will render its comments to Federal agencies when their undertakings affect properties included in or eligible for inclusion in the National Register of Historic Places. To facilitate processing of the large volume of cases submitted for Council comment each year, the regulations provide for agency consultation with the Council staff and State Historic Preservation Officers to reduce the number of undertakings that require consideration by the full Council.

The purpose of the present amendments is to reduce procedural delay, encourage agencies to develop internal regulations to comply with the requirements of the Act and these regulations, to clarify the process since the last publication of the Council's regulations in 1974, and to implement the directives in the President's Memorandum on Environmental Quality and Water Resources Management.

In late 1977, the Council staff began a reassessment of the existing regulations codified in 1974 in 36 CFR Part 800, in an effort to determine what changes, clarifications, or modifications were necessary. In July of 1978, the President issued the Memorandum on Environmental Quality and Water Resources Management which directed the Chairman of the Council to review and promulgate regulations implementing the Presidential Memorandum by March 1, 1979. Accordingly, the existing regulations were amended to reflect changes in statutory authority, experience gained in implementing the procedures since 1974, and to meet the demands of the President's Memorandum.

The Council published proposed amendments to the existing regulations in the FEDERAL REGISTER on October 30, 1978, and invited public comment for a 30 day period. A number of Federal agencies and others requested extension of the comment period. On November 28, 1978, the Council published notice in the FEDERAL REGISTER extending the comment period for an additional thirty days until December 29, 1978, providing for a 60 day comment period in total. A public briefing for interested agencies, organizations, and individuals on the proposed amendments was held on December 11, 1978. Council staff also actively cooperated with the Secretary of the Interior's Water Policy Implementation Task Force on Environmental Statutes. The Task Force was convened in response to the directives contained in the President's Memorandum. The Task Force was charged with reviewing the draft regulations and informally offering comments to the Council on whether the regulations comply with the directive.

Pursuant to the President's Memorandum, agencies with consultation responsibilities under the Act must develop regulations to be approved by the Chairman of the Council in response to these regulations. Such agencies must publish regulations no later than three months after the effective date of these regulations. Other agencies may choose to adopt counterpart regulations specifically tailored to their particular program needs as stipulated in these regulations.

These regulations issued pursuant to 16 U.S.C. 470s were adopted by unanimous vote of the full Council in open session on January 17, 1979. As directed by the President, the amended regulations will be effective March 1, 1979.

SUMMARY OF MAJOR CHANGES

The flow of the commenting process established by the 1974 regulations remains basically unchanged in the present amendments. However, the regulations have been renumbered and rearranged from the 1974 publication for greater clarity. The following major changes have been made in the regulations:

1. Section 800.4(a) has been substantially revised to provide further guidance to Federal agencies on the identification of National Register and eligible properties.

2. A new § 800.5 has been added to define the responsibilities of State Historic Preservation Officers in the commenting process.

3. Section 800.6(d) authorizes the Chairman to appoint a panel of five members of the Council to consider undertakings in lieu of consideration by the full Council.

4. A new § 800.7 has been added dealing with resources discovered during construction.

5. A new § 800.8 has been added dealing with Programmatic Memoranda of Agreement allowing an agency to obtain the Council's comments for a particular program or class of undertakings that would otherwise require numerous individual requests for comments.

6. Section 800.9 revises the original section dealing with the National Environmental Policy Act to reflect new Council on Environmental Quality regulations.

7. A new § 800.11 has been added to authorize counterpart regulations permitting agencies to develop regulations which, if approved by the Chair-

mmen, may be used to meet certain requirements of these regulations.

8. A new § 800.15 has been added dealing with public participation in the Section 106 review process.

A new § 800.14 has been added on Supplementary Guidance. The Supplementary Guidelines included in the proposed amendments have been deleted. Supplementary Guidelines II and IV have been included in § 800.13.

10. Throughout the amended regulations, time limits have been established to expedite the process while encouraging maximum public participation.

Comments and the Council's Response

The Council received 128 comments prior to the close of the comment period on December 29, 1978. An additional 16 comments were received between December 30, 1978, and the Council meeting on January 17 and 18, 1979. All comments were submitted to the Council members for review prior to the meeting. Comments were received from 32 Federal agencies, 27 State Historic Preservation Officers, 33 State or local governments, and 52 private organizations or individuals, and one U.S. Senator.

Section 800.1 Purpose and Authorities

The section was slightly reworded in response to several suggestions to bring the language closer to that of the Act and Executive Order. A section was added summarizing the President's Memorandum on Environmental Quality and Water Resources Management.

Section 800.2 Definitions

Section 800.2(c) was clarified in response to several agency comments that the scope of the term "undertaking" was too broad and unclear. Of particular concern was the inclusion of activities proposed by Federal agencies for Congressional authorization or appropriation. This definition is not to be construed as requiring general program authorization and program appropriation requests to be reviewed under these regulations. The purpose is to ensure proper and timely consideration of specific activities that will have significant impacts on National Register or eligible properties and that provide limited opportunity after Congressional action to consider alternatives to avoid or mitigate these impacts. Such activities are usually major Federal construction projects that are proposed for Congressional approval at a specific site or with specific design features, such as a dam. Section 106 review would be appropriate prior to authorization or, in the case of projects authorized without prior Section 106 compliance, during the agency's formulation of a budget request to be submitted to the Office of Management and Budget. In either event agencies should complete their Section 106 responsibilities prior to making submissions to the Office of Management and Budget. Agencies will comply with the requirements of OMB Circular A-10, which concerns budget confidentiality.

Authorizations for programs that will have uniform adverse effects on National Register or eligible properties and where the legislative terms of authorization may severely limit the opportunity to avoid or mitigate adverse effects on a case by case basis are also included. An example would be the recent Special Bridge Replacement Program, which, in its original form, prohibited the use of funds for anything but replacement of unsafe bridges. The result was that alternatives such as rehabilitation were foreclosed when a particular National Register or eligible bridge was proposed for replacement. When seeking Council comments on such a program agencies should follow the provisions of § 800.8, "Programmatic Memorandum of Agreement."

The definition of eligible property contained in § 800.2(f) has been rewritten to more closely reflect statutory language and thus changed in response to a Federal member agency. Several commenters were of the opinion that the Council should review only those undertakings affecting properties actually listed on the National Register. Such a limitation is contrary to the mandate of the National Historic Preservation Act, and is not adopted.

A definition of the area of the undertaking's potential environmental impact is contained in § 800.2(o). Several comments expressed concern about the difficulty in defining this term. The definition no longer includes reference to secondary effects and is consistent with the definition adopted by the Council on Environmental Quality. This new section has been modified since the draft amendments by the addition of the requirement that the boundaries of such an area are to be determined by the Agency Official and the State Historic Preservation Officer.

Section 800.2(p), Consulting Parties, is a new section. Many commenters expressed confusion as to who the parties to the consultation process were.

Section 800.3 Criteria of Effect and Adverse Effect

Section 800.3 was the subject of many comments. The entire section has been reworked for greater clarity. A definition of direct and indirect effects has been added and the definition deliberately tracks that used by the Council on Environmental Quality for purposes of the National Environmental Policy Act. The new language of this section is now tied closely to the National Register Criteria. One commenter suggested that only significant effects be covered by these regulations. This comment was not adopted because it is contrary to statutory requirements.

Section 800.4 Federal Agency Responsibilities

This section describes the means by which a Federal agency should identify National Register or eligible properties and determine whether an undertaking affects such properties and provides for coordination with the State Historic Preservation Officers. A large number of comments were received on the entire section. Many Federal agencies felt that further clarification of the entire section was needed. In response to these comments, the section has been re-structured. The Council has adopted a reasonable effort standard for Federal agencies to meet in identifying National Register and eligible properties. Federal agency responsibilities for determination of effect are also set forth in this section. The ultimate responsibility for compliance with the regulations rests with the Federal agency and cannot be delegated by it.

Section 800.4(a) has been altered in response to numerous comments including several from Federal agencies. The section has been re-drafted to set forth a logical sequence needed to identify properties. Throughout the process of identification, there should be consultation between the Agency Official and the State Historic Preservation Officer. The section makes clear that an agency can request the Council's comments simultaneously with a request for eligibility from the Secretary of the Interior. The Council believes that the reorganized section is clearer and that it will allow agencies to know in more precise terms what is required to identify National Register or eligible properties.

Section 800.4(b), Determination of Effect, also received numerous comments from Federal agencies and others. The section on No Effect (800.4(b)(1)) has been clarified concerning how an objection can be made and the manner in which the Executive Director will respond.

Section 800.4(c) concerning Determination of No Adverse Effect has been clarified in response to several comments. No Adverse Effect Determinations must be made in consultation with the appropriate State Historic Preservation Officer and evidence of contact with a State Historic Preservation Officer must be included in the documentation forwarded to the

Council if the State Historic Preservation Officer does not respond to a request under the provisions of § 800.5.

tion 800.4(d) has been slightly al- in response to several comments. ransmittal of a Preliminary Case Report will be the request for the comments of the Council.

A new § 800.4(e) has been added providing that good faith consultation would prevent an agency from proceeding with an undertaking until the Council has provided its comments. The section, while appearing in substantially the same form in several sections in the draft amendments, is now one section. It is included as one section at the request of a Federal agency member of the Council.

SECTION 800.5 STATE HISTORIC PRESERVATION OFFICER RESPONSIBILITIES

Section 800.5, State Historic Preservation Officer Responsibilities, is a new section. The section establishes deadlines for response on the part of this official, after which the process may continue if no response has been received. Pursuant to a substantial number of comments, however, lack of response by the State Historic Preservation Officer will no longer be deemed concurrence, although the review may still proceed. Several commenters suggested that the "shoulds" used in this section be changed to "" ". The suggestion was rejected e the Council lacks authority to mandatory requirements on these State officials.

SECTION 800.6 COUNCIL COMMENTS

This section concerns the manner in which the Council will render its comments. There were a substantial number of comments on this section. In response to these comments, numerous changes were made to clear up ambiguities and make the Council's commenting process more expeditious.

Section 800.6(a) concerns the manner in which the Executive Director will respond to an agency Determination of No Adverse Effect. In response to comments, a specific time limit has been placed on the Executive Director's acceptance of adequate documentation and the time period for review of such Determinations of No Adverse Effect has been reduced from the 45 days stipulated in the 1974 regulations to 30 days.

A new § 800.6(a)(2) provides that the Executive Director may specify conditions to remove an objection to a No Adverse Effect Determination. Several commenters suggested that the State Historic Preservation Officer should be included in this process. It is the intention of the Council to include the State Historic Preservation Officer t h the addition of a provision in § a)(2) which allows the Executive Director to consult the State Historic Preservation Officer and other interested parties.

Section 800.6(b) parallels the existing regulations. However, several changes have been made, including provisions for specific time limits throughout the consultation process. Although a number of commenters felt that parties in interest to an undertaking should have the status of a consulting party, these comments were not adopted because the Council does not believe that it can impose such a uniform requirement due to the wide variety of agency programs. At the request of several Federal agencies, a lead agency provision is also included in this section.

In response to comments, § 800.6(b)(3) has been changed to provide that the public information meeting should be held near the site of the undertaking.

A new § 800.6(b)(6) on acceptance of adverse effect has been included. Previously, the Council equated acceptance of Adverse Effect with mitigation measures such as recording of a structure that was being demolished. The Council realizes that there are circumstances in which adverse effects on National Register or eligible properties must be accepted in the public interest. In such instances, the adverse effect will be accepted, generally with a proviso that a recording effort be part of the agreement.

Section 800.6(b)(7) has been clarified in response to comments. Any one of the consulting parties may declare a failure in the consultation process upon written notice to the Executive Director who is required to notify the Chairman of the failure within 15 days.

Section 800.6(c) concerning the Memorandum of Agreement has been rewritten in response to comments. An important change from the existing regulations is an expedited method for preparing the Memorandum of Agreement. A Federal agency will prepare a proposal, which together with the written concurrence of the State Historic Preservation Officer can be transmitted to the Executive Director and incorporated into the Memorandum of Agreement.

Many commenters agreed with the Council that this would speed up the process, but only if there were time limits placed on the process for ratification of an agreement. The Council agreed and a limit of 10 days has been imposed for transmittal of such Memoranda to the Chairman.

A new § 800.6(c)(3) dealing with the effect of a Memorandum of Agreement has been added. This subsection provides that if an agency fails to carry out the terms of the agreement that the comments of the Council must again be requested. Several commenters suggested that in such instances agencies should be admonished that no further action on the undertaking should proceed until the Council has commented. The Council agrees and this section has been revised accordingly.

In response to comments, § 800.6(c)(4) has been changed to provide that any signatory to the agreement can request a change in the terms. At the request of several commenters a new section has also been added which requires the Agency Official to provide a report on actions taken to carry out the terms of the agreement.

Section 800.6(d) dealing with Council meetings has been revised in response to comments. When the Chairman decides against consideration by the Council of a proposed undertaking, it can be scheduled if three members of the Council object. The proposed amendments would have required that a majority of the members object. Numerous commenters felt that such a large number was unrealistic. A major change from the 1974 regulations is the provision for a panel of members to consider an undertaking on behalf of the full Council. Such a panel would be composed of 5 members, three non-Federal members and two Federal members, neither of whom represents the agency proposing the undertaking. The Council believes that this provision will serve to both increase the number of cases referred for Council consideration and to expedite these cases. Several Council members felt that consideration of an undertaking by a panel would not be representative of the full range of views provided by the entire Council membership. After discussion at the full Council meeting on January 17, 1979, it was agreed that panel consideration of an undertaking may be advantageous in some situations. However, the Council felt that this provision should be re-examined in one year to determine the effectiveness of panel review of undertakings.

A number of comments were received on the section dealing with the review of a panel decision. Many commenters pointed out that an appeal of a panel decision by any one of the parties involved as proposed in the draft amendments could actually delay the process rather than speeding it up. The Council agrees with this assessment and the appeal provision has been deleted. However, if an agency determines not to follow the comments of a panel after considering the comments, it must provide notice to the Chairman in order to provide opportunity to have the matter considered by the full Council. Because of the nature of panel consideration of

an undertaking, the comments were not adopted which suggested that no cons' 'tion of an undertaking bey' anel was necessary.

In . onse to comments, time limits for notice of Council meetings and statements to the Council have been extended to provide ample opportunity for public participation. Section 800.6(d)(5) has been changed to provide that the comments of the Council will be issued within 15 days after a meeting and that such comments will be made available to interested parties, including the State Historic Preservation Officer.

Section 800.7 Resources Discovered During Construction

This section was proposed as a addition to the 1974 regulations. As originally proposed, the section was intended to establish a limited time period for the Council to provide its comments to an agency when a resource eligible for the National Register was discovered during the actual construction of a project after an agency had previously completed its Section 106 responsibilities. While there were several unqualified endorsements, the majority of the commenters felt that the section as proposed would cause undue project delays resulting in additional costs. The section was substantial' written in light of these comme' he mandatory halt of construc. has been eliminated, although the Council believes that good faith consultation requires that an agency make reasonable efforts to avoid foreclosing options while the Council's comments are being sought. As drafted, § 800.7 applies only to those resources discovered during construction that meet the National Register Criteria. Agencies that discover National Register eligible properties during construction are required to comply with the provisions of the Archeological and Historic Preservation Act of 1974. The Council is adopting, as the standard for Section 106 compliance, mitigation acceptable to the Secretary of the Interior under the provisions of the Archeological and Historic Preservation Act. Therefore, an agency will be deemed to have met its responsibilities to afford the Council an opportunity to comment if it complies with the provisions of the Archeological and Historic Preservation Act, unless the Secretary determines that certain aspects of the undertaking warrant Council consideration. If Council consideration is determined to be necessary, a 30-day time limit has been placed on the transmittal of comments. The Council believes that this pr ' will serve to reduce time de. id effectively protect the resou.

Section 800.8 Programmatic Memorandum of Agreement

This section was developed as a means of allowing the Council to comment on a particular program or class of actions that would otherwise require multiple individual requests for comments under the regulations. This will expedite the review process and eliminate individual reviews of undertakings that are repetitive in nature. For example, the Council has executed a programmatic agreement with the National Park Service concerning the Park planning system. Under the terms of the agreement, individual actions taken to implement a master plan for a particular park that has previously been reviewed by the Council will normally not be subjected to further Council review.

A number of commenters suggested that the process include the State Historic Preservation Officers in States affected by such agreement or the National Conference of State Historic Preservation Officers when the agreement is nationwide in scope. The regulations have been revised to specifically allow for such participation. Other changes have been made in the section to clarify ambiguities pointed out by a number of commenters.

Section 800.9 Coordination with the National Environmental Policy Act

This section sets forth the manner in which the review conducted under Section 106 should be coordinated with that required by the National Environmental Policy Act. This section elaborates on § 800.2 of the 1974 regulations and has been developed in consultation with the staff of the Council on Environmental Quality. It is the intention of the two agencies to issue joint supplementary guidance on this subject in the near future. The purpose of the section is to combine to the maximum extent possible the information on resources, evaluation of effects, and analysis of alternatives required by the separate statutes. For most projects, the Council's comments should be requested during the preparation of the draft environmental impact statement. Some commenters noted several classes of Federal projects which cannot be coordinated in this manner. The regulations have been revised to specifically provide for this situation. It is the Council's objective to provide its comments on an agency undertaking that requires an environmental impact statement in time to be included in the final statement. This should result in less paperwork and reduce delays in fulfilling agency environmental review responsibilities by allowing a single document to be used to meet the information requirements of both statutes.

Section 800.10 Coordination with the President's Memorandum on Environmental Quality and Water Resources Management

This section recapitulates the mandates contained in the Memorandum to agencies with water resources responsibilities to develop regulations to implement the Council's Section 106 regulations. A number of commenters requested the Council to add requirements for additional review of the required regulations and to develop stringent standards for the regulations. The Council will issue guidance to agencies to develop such regulations.

Section 800.11 Counterpart Regulations

This section has been revised to allow Federal agencies greater flexibility in implementing the procedural requirements of these regulations. Section 800.11 as proposed in the draft amendments dealt briefly with the development of agency procedures under Section 1(3) of Executive Order 11593. The revised section was developed from suggestions received from several Federal agencies. Under this section, an agency may choose to develop counterpart regulations that can be tailored to meet the specific requirements of its planning and decision making processes. Section 800.11 would permit agencies to develop counterpart regulations for meeting their responsibilities under Section 800.4. This section requires that the regulations be jointly drafted with the Executive Director and approved by the Chairman and provides an opportunity for public participation.

Section 800.12 Investigation of Threats to National Register and Eligible Properties

This section deals with situations where the Council has reason to believe that a Federal undertaking affecting a National Register or eligible property has not been reviewed in accordance with these regulations. Several clarifications were made to this section in response to specific comments. Some Federal agencies expressed a desire that the Council use discretion in investigating such threats. The Council intends to do so. Previously, these provisions were included in § 800.13(b). In the draft of the proposed amendments § 800.13(a) included a provision for comment or report on non-Federal undertakings. This section has been deleted because it is based on the Council's general advisory authorities under Section 202 of the Act and not on Section 106. The Council will continue to exercise its general advisory authority under Sec-

ther... and will consider matters in the public interest.

SECTION 800.13 REPORTS TO THE COUNCIL

This section sets standards for information that should be provided to the Council to enable it to make informed comments on Federal undertakings. Sections 800.13(a) and (b) were previously included in the Supplementary Guidelines section. A large number of commenters requested that these standards for adequate documentation be codified. The Council agrees with these comments and believes that codifying these sections will make the requirements clear to all the consulting parties and the public. Section 800.13(c) dealing with Reports for Council Meetings includes a new section prescribing the Secretary of the Interior's Report. This section requests the Secretary to verify existing information on the historical or cultural significance of a National Register or eligible property and reflects the current practice of the Council. A number of commenters felt that the section was not entirely clear concerning how reports for Council meetings should be coordinated. The section has been drafted to respond to these co... s.

SECTION 800.14 SUPPLEMENTARY GUIDANCE

This is a new section which provides that the Executive Director may issue further guidance to interpret certain portions of the regulations.

SECTION 800.15 PUBLIC PARTICIPATION

This is a new section which is designed to encourage public participation throughout the process established by the regulations. A number of comments urged that the regulations contain more explicit direction concerning the means of involving the public. Several suggested that such reference to public participation be included in various specific sections. The Council believes that a specific section dealing with public participation will best serve to fulfill the intended purpose of involving the public. The Council notes that its process is advisory and does not constitute formal administrative hearings. Therefore, this section is intended for guidance and is not to be construed as setting a strict legal standard. For example, the use of the word "notice" in subsection (b) is not intended to be a formal legal re... ment, but rather a means of in... the public of an opportunity to ...cipate in the process.

OTHER

The Supplementary Guidelines contained in the publication of the draft amendments have been deleted. Supplementary Guidelines II and IV have been codified as part of § 800.13. Supplementary Guideline I, the Criteria of the National Register of Historic Places, is contained in 36 CFR 60.6. Supplementary Guideline III, Determinations of No Effect and No Adverse Effect for Archeological Resources, will not be published at the present time. The Council's Task Force on Archeology will be considering this guideline and it will be revised based upon recommendations of the Task Force. This Guideline received numerous comments and they have been provided to the Task Force for its consideration.

CONCLUSION

The Council made a conscientious effort to incorporate all valid comments in these final amendments. As noted, revisions have been made to the regulations which we believe will serve to make the Section 106 commenting process an open and public process that can be tailored to the needs of individual agencies. The Council believes that the regulations set a clear standard for agencies to follow in meeting their Section 106 responsibilities, while being sufficiently flexible to respond to the wide variety of agency programs and needs.

The Council has determined that these amendments are not significant regulations within the meaning of Executive Order 12044 and consequently do not require a regulatory analysis. The purpose of these amendments is to simplify existing regulations and to clarify language in conformance with the goals enunciated by Executive Order 12044.

The Council has determined that an Environmental Impact Statement under the National Environmental Policy Act is not required.

PRINCIPAL AUTHORS

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ROBERT R. GARVEY, JR.,
Executive Director.

Part 800 is revised to read as set forth below:

PART 800—PROTECTION OF HISTORIC AND CULTURAL PROPERTIES

Sec.

AUTHORITY: Pub. L. 89-665, 80 Stat. 915 (16 U.S.C. 470), as amended, 84 Stat. 204 (1970), 87 Stat. 139 (1973), 90 Stat. 1320 (1976), 92 Stat. 3467 (1978); E.O. 11593, 3 CFR 1971 Comp. p. 154; President's Memorandum on Environmental Quality and Water Resources Management, July 12, 1978.

§ 800.1 Purpose and authorities.

(a) The National Historic Preservation Act of 1966, as amended, established the Advisory Council on Historic Preservation as an independent agency of the United States to advise the President and the Congress on historic preservation matters, recommend measures to coordinate Federal historic preservation activities, and comment on Federal actions affecting properties included in or eligible for inclusion in the National Register of Historic Places. Its members are the Secretary of the Interior, the Secretary of Housing and Urban Development, the Secretary of Commerce, the Administrator of General Services, the Secretary of the Treasury, the Attorney General, the Secretary of Agriculture, the Secretary of Transportation, the Secretary of State, the Secretary of Defense, the Secretary of Health, Education, and Welfare, the Chairman of the Council on Environmental Quality, the Chairman of the Federal Council on the Arts and Humanities, the Architect of the Capitol, the Secretary of the Smithsonian Institution, the Chairman of the National Trust for Historic Preservation, the President of the National Conference of State Historic Preservation Officers, and 12 citizen members from outside the Federal Government appointed for five-year terms by the President on the basis of their interest and experience in the matters to be considered by the Council.

(b) The Council protects properties of historical, architectural, archeological, and cultural significance at the na-

tional, State, and local level by reviewing and commenting on Federal actions affecting National Register and eligible properties in accordance with the following authorities:

(1) Section 106 of the National Historic Preservation Act. Section 106 requires that Federal agencies with direct or indirect jurisdiction over a Federal, federally assisted or federally licensed undertaking afford the Council a reasonable opportunity for comment on such undertakings that affect properties included in or eligible for inclusion in the National Register of Historic Places prior to the agency's approval of any such undertaking.

(2) Section 1(3) of Executive Order 11593, May 13, 1971, "Protection and Enhancement of the Cultural Environment." Section 1(3) requires that Federal agencies, in consultation with the Council, institute procedures to assure that their plans and programs contribute to the preservation and enhancement of non-federally owned historic and cultural properties.

(3) Section 2(b) of Executive Order 11593, May 13, 1971, "Protection and Enhancement of the Cultural Environment." Federal agencies are required by Section 2(a) of the Executive Order to locate, inventory, and nominate properties under their jurisdiction or control to the National Register. Until such processes are complete, Federal agencies must provide the Council an opportunity to comment on proposals for transfer, sale, demolition, or substantial alteration of federally owned properties eligible for inclusion in the National Register.

(4) The President's Memorandum on Environmental Quality and Water Resources Management. The Memorandum directs the Council to issue final regulations under the National Historic Preservation Act by March 1, 1979, and further directs Federal agencies with water resource responsibilities and programs to publish procedures implementing the Act not later than three months after promulgation of final regulations by the Council. Federal agencies' procedures are to be reviewed and, if they are consistent with the Council's regulations, approved by the Council within 60 days and published in final form.

§ 800.2 Definitions.

As used in these regulations:

(a) "National Historic Preservation Act" means Pub. L. 89-665, approved October 15, 1966, an "Act to establish a program for the preservation of additional historic properties throughout the Nation and for other purposes" (80 Stat. 915, 16 U.S.C. 470, as amended; 84 Stat. 204 (1970), 87 Stat. 139 (1973), 90 Stat. 1320 (1976), 92 Stat. 3467 (1978)), hereinafter referred to as "the Act."

(b) "Executive Order" means Executive Order 11593, May 13, 1971, "Protection and Enhancement of the Cultural Environment" (36 FR 8921, 16 U.S.C. 470).

(c) "Undertaking" means any Federal, federally assisted or federally licensed action, activity, or program or the approval, sanction, assistance, or support of any non-Federal action, activity, or program. Undertakings include new and continuing projects and program activities (or elements of such activities not previously considered under Section 106 or Executive Order 11593) that are: (1) Directly undertaken by Federal agencies; (2) supported in whole or in part through Federal contracts, grants, subsidies, loans, loan guarantees, or other forms of direct and indirect funding assistance; (3) carried out pursuant to a Federal lease, permit, license, certificate, approval, or other form of entitlement or permission; or, (4) proposed by a Federal agency for Congressional authorization or appropriation. Site-specific undertakings affect areas and properties that are capable of being identified at the time of approval by the Federal agency. Non-site-specific undertakings have effects that can be anticipated on National Register and eligible properties but cannot be identified in terms of specific geographical areas or properties at the time of Federal approval. Non-site-specific undertakings include Federal approval of State plans pursuant to Federal legislation, development of comprehensive or area-wide plans, agency recommendations for legislation and the establishment or modification of regulations and planning guidelines.

(d) "National Register" means the National Register of Historic Places. It is a register of districts, sites, buildings, structures, and objects of national, State, or local significance in American history, architecture, archeology, and culture that is expanded and maintained by the Secretary of the Interior under authority of section 2(b) of the Historic Sites Act of 1935 (49 Stat. 666, 16 U.S.C. 461) and Section 101(a)(1) of the National Historic Preservation Act implemented through 36 CFR Part 60. The National Register is published in its entirety in the FEDERAL REGISTER each year in February. Addenda are usually published on the first Tuesday of each month.

(e) "National Register property" means a district, site, building, structure, or object included in the National Register.

(f) "Eligible property" means any district, site, building, structure, or object that meets the National Register Criteria.

(g) "National Register Criteria" means the criteria established by the Secretary of the Interior to evaluate properties to determine whether they are eligible for inclusion in the National Register. (See 36 CFR 60.6.)

(h) "Decision" means the exercise of or the opportunity to exercise discretionary authority by a Federal agency at any stage of an undertaking where alterations might be made in the undertaking to modify its impact upon National Register and eligible properties.

(i) "Agency Official" means the head of the Federal agency having responsibility for the undertaking or a designee authorized to act for the Agency Official.

(j) "Council" means the Advisory Council on Historic Preservation as established by Title II of the Act.

(k) "Chairman" means the Chairman of the Advisory Council on Historic Preservation or a member designated to act for the Chairman.

(l) "Executive Director" means the Executive Director of the Advisory Council on Historic Preservation as established by Section 205 of the Act, or a designee authorized to act for the Executive Director.

(m) "State Historic Preservation Officer" means the official, who is responsible for administering the Act within the State or jurisdiction, or a designated representative authorized to act for the State Historic Preservation Officer. These officers are appointed pursuant to 36 CFR Part 61.2 by the Governors of the 50 States, Guam, American Samoa, the Commonwealth of Puerto Rico, the Virgin Islands, the Trust Territory of the Pacific Islands, the Commonwealth of the Mariana Islands, and the Mayor of the District of Columbia.

(n) "Secretary" means the Secretary of the Interior or a designee authorized to carry out the historic preservation responsibilities of the Secretary under the Act, Executive Order 11593, and related authorities.

(o) "Area of the undertaking's potential environmental impact" means that geographical area within which direct and indirect effects generated by the undertaking could reasonably be expected to occur and thus cause a change in the historical, architectural, archeological, or cultural qualities possessed by a National Register or eligible property. The boundaries of such area should be determined by the Agency Official in consultation with the State Historic Preservation Officer as early as possible in the planning of the undertaking.

(p) "Consulting parties" means the Agency Official, the State Historic Preservation Officer, and the Executive Director.

§ 800.3 Criteria of effect and adverse effect.

following criteria shall be used to determine whether an undertaking has an effect or an adverse effect in accordance with these regulations.

(a) *Criteria of Effect.* The effect of a Federal, federally assisted or federally licensed undertaking on a National Register or eligible property is evaluated in the context of the historical, architectural, archeological, or cultural significance possessed by the property. An undertaking shall be considered to have an effect whenever any condition of the undertaking causes or may cause any change, beneficial or adverse, in the quality of the historical, architectural, archeological, or cultural characteristics that qualify the property to meet the criteria of the National Register. An effect occurs when an undertaking changes the integrity of location, design, setting, materials, workmanship, feeling, or association of the property that contributes to its significance in accordance with the National Register criteria. An effect may be direct or indirect. Direct effects are caused by the undertaking and occur at the same time and place. Indirect effects include those caused by the undertaking that are later in time or farther removed in distance, but are still reasonably foreseeable. effects may include changes in attern of land use, population density or growth rate that may affect on properties of historical, architectural, archeological, or cultural significance.

(b) *Criteria of Adverse Effect.* Adverse effects on National Register or eligible properties may occur under conditions which include but are not limited to:

(1) Destruction or alteration of all or part of a property;

(2) Isolation from or alteration of the property's surrounding environment;

(3) Introduction of visual, audible, or atmospheric elements that are out of character with the property or alter its setting;

(4) Neglect of a property resulting in its deterioration or destruction.

(5) Transfer or sale of a property without adequate conditions or restrictions regarding preservation, maintenance, or use.

REVIEW OF INDIVIDUAL UNDERTAKINGS

§ 800.4 Federal Agency responsibilities.

As early as possible before an agency makes a final decision concerning an undertaking and in any event prior to taking any action that would foreclose alternatives or the Council's ability to comment, the Agency Official shall the following steps to comply with the requirements of Section 106 of the National Historic Preservation Act and Section 2(b) of Executive Order 11593. It is the primary responsibility of each Agency Official requesting Council comments to conduct the appropriate studies and to provide the information necessary for an adequate review of the effect a proposed undertaking may have on a National Register or eligible property, as well as the information necessary for adequate consideration of modifications or alterations to the proposed undertaking that could avoid, mitigate, or minimize any adverse effects. It is the responsibility of each Agency Official requesting consultation with a State Historic Preservation Officer under this section to provide the information that is necessary to make an informed and reasonable evaluation of whether a property meets National Register criteria and to determine the effect of a proposed undertaking on a National Register or eligible property. Although a Federal agency may require non-Federal parties to undertake certain steps required by these regulations as a prerequisite to Federal action and may authorize non-Federal participation under this section and in the consultation process under Section 800.6 pursuant to counterpart regulations, the ultimate responsibility for compliance with these regulations remains with the Federal agency and cannot be delegated by it.

(a) *Identification of National Register and Eligible Properties.* It is the responsibility of each Federal agency to identify or cause to be identified any National Register or eligible property that is located within the area of the undertaking's potential environmental impact and that may be affected by the undertaking.

(1) The Agency Official shall consult the State Historic Preservation Officer, the published lists of National Register and eligible properties, public records, and other individuals or organizations with historical and cultural expertise, as appropriate, to determine what historic and cultural properties are known to be within the area of the undertaking's potential environmental impact. The State Historic Preservation Officer should provide the Agency Official with any information available on known historic and cultural properties identified in the area (whether on the National Register or not), information on any previous surveys performed and an evaluation of their quality, a recommendation as to the need for a survey of historic and cultural properties, and recommendations as to the type of survey and/or survey methods should a survey be recommended, and recommendations on boundaries of such surveys.

(2) The Agency Official shall, after due consideration of the information obtained pursuant to § 800.4(a)(1), determine what further actions are necessary to discharge the agency's affirmative responsibilities to locate and identify eligible properties that are within the area of the undertaking's potential environmental impact and that may be affected by the undertaking. Such actions may include a professional cultural resources survey of the environmental impact area, or parts of the area, if the area has not previously been adequately surveyed. The recommendations of the State Historic Preservation Officer should be followed in this matter.

(3) The Agency Official, in consultation with the State Historic Preservation Officer, shall apply the National Register criteria to all properties that may possess any historical, architectural, archeological, or cultural value located within the area of the undertaking's potential environmental impact. If either the Agency Official or the State Historic Preservation Officer finds that a property meets the National Register Criteria or a question exists as to whether a property meets the Criteria, the Agency Official shall request a determination of eligibility from the Secretary of the Interior in accordance with 36 CFR Part 63. The opinion of the Secretary respecting the eligibility of a property shall be conclusive for the purposes of these regulations. If the Agency Official and the State Historic Preservation Officer agree that no identified property meets the Criteria, the Agency Official shall document this finding and, unless the Secretary has otherwise made a determination of eligibility under 36 CFR Part 63, may proceed with the undertaking.

(4) The Agency Official shall complete the preceding steps prior to requesting the Council's comments pursuant to Section 800.4(b)-(d). The Agency Official may, however, initiate a request for the Council's comments simultaneously with a request for a determination of eligibility from the Secretary when the Agency Official and the State Historic Preservation Officer agree that a property meets the National Register Criteria. Before the Council completes action pursuant to § 800.6, the Secretary must find the property eligible for inclusion in the National Register.

(b) *Determination of Effect.* For each National Register or eligible property that is located within the area of the undertaking's potential environmental impact, the Agency Official, in consultation with the State Historic Preservation Officer, shall apply the Criteria of Effect, (§ 800.3(a)), to determine whether the undertaking will have an effect upon the historical, architectural, archeological, or cultural characteristics of

he property that qualified it to meet National Register Criteria.

(1) *No Effect.* If the Agency Official, in consultation with the State Historic Preservation Officer, finds that the undertaking will not affect these characteristics, the undertaking may proceed. The Agency Official shall document each Determination of No Effect, which shall be available for public inspection. If the State Historic Preservation Officer objects or other timely objection is made to the Executive Director to an Agency Official's Determination of No Effect, the Executive Director may review the Determination and advise the Agency Official, the State Historic Preservation Officer and any objecting party of the findings within 15 days.

(2) *Effect determined.* If the Agency Official or the Executive Director finds that the undertaking will have an effect upon these characteristics, the Agency Official, in consultation with the State Historic Preservation Officer, shall apply the Criteria of Adverse Effect, set forth in section 800.3(b), to determine whether the effect of the undertaking may be adverse.

(c) *Determinations of no adverse effect.* If the Agency Official, in consultation with the State Historic Preservation Officer, finds the effect on the historical, architectural, archeological or cultural characteristics of the property not to be adverse, the Agency Official shall forward adequate documentation (See § 800.13(a)) of the Determination, including written evidence of the views of the State Historic Preservation Officer, to the Executive Director for review in accordance with Section 800.6. If the State Historic Preservation Officer fails to respond to an Agency Official's request as provided in Section 800.5, the Agency Official shall include evidence of having contacted the State Historic Preservation Officer.

(d) *Adverse effect determination.* If the Agency Official finds the effect on the historical, architectural, archeological, or cultural characteristics of the property to be adverse, or if the Executive Director does not accept an Agency Official's Determination of No Adverse Effect pursuant to review under Section 800.6, the Agency Official shall:

(1) Prepare and submit a Preliminary Case Report requesting the comments of the Council (See § 800.13(b)),

(2) Notify the State Historic Preservation Officer of this request, and

(3) Proceed with the consultation process set forth in § 800.6.

(e) *Suspense of action.* Until the Council issues its comments under these regulations, good faith consultation shall preclude a Federal agency from approving or sanctioning any action or making any irreversible or irretrievable commitment that could result in an adverse effect on a National Register or eligible property or that would foreclose the consideration of modifications or alternatives to the proposed undertaking that could avoid, mitigate, or minimize such adverse effects.

§ 800.5 State Historic Preservation Officer responsibilities.

(a) The State Historic Preservation Officer should participate in the review process established by these regulations as it concerns an undertaking located within the State Historic Preservation Officer's jurisdiction.

(b) Unless a longer time is agreed to by the Agency Official, the failure of a State Historic Preservation Officer to respond to an Agency Official's request for consultation under Section 800.4 within 30 days after receipt shall not prohibit the Agency Official from proceeding with the review process under these regulations.

(c) The State Historic Preservation Officer, with the Agency Official and the Executive Director, should participate in any consultation under § 800.6(b) and sign any Memorandum of Agreement developed under § 800.6(c) of these regulations. Failure of a State Historic Preservation Officer to participate in a consultation under § 800.6(b) or to sign a Memorandum of Agreement as provided in § 800.6(c)(1) within 30 days of receipt without notifying the Executive Director and the Agency Official that the State Historic Preservation Officer disagrees with the terms of the Agreement shall not prohibit the Executive Director and the Agency Official from concluding the Agreement and having it ratified by the Chairman in accordance with § 800.6(c)(2).

§ 800.6 Council comments.

The following subsections specify how the Council will respond to Federal agency requests for the Council's comments required to satisfy an agency's responsibilities under Section 106 of the Act and Section 2(b) of the Executive Order.

(a) *Response to determinations of no adverse effect.* (1) Upon receipt of a Determination of No Adverse Effect from an Agency Official, the Executive Director will review the Determination and supporting documentation. Normally, the Executive Director will concur without delay. If the documentation is not adequate, the Executive Director will so inform the Agency Official within 15 days. Unless the Executive Director objects to the Determination within 30 days after receipt of an adequately documented Determination, the Agency Official will be considered to have satisfied the agency's responsibilities under Section 106 of the Act, Section 2(b) of the Executive Order, and these regulations, and may proceed with the undertaking.

(2) If the Executive Director objects to a Determination of No Adverse Effect, the Executive Director shall specify the basis for the objection and may specify conditions which will eliminate the objection. As appropriate, the Executive Director may consult the Agency Official, the State Historic Preservation Officer, and other interested parties in specifying conditions. If the Agency Official accepts the conditions in writing, the conditions will be incorporated into the agency's Determination and the Executive Director's objection will be withdrawn. The Agency Official then will be considered to have satisfied the agency's responsibilities under Section 106 of the Act, Section 2(b) of the Executive Order, and these regulations, and may proceed with the undertaking.

(3) If the Agency Official does not accept the Executive Director's conditions or if the Executive Director objects to a Determination of No Adverse Effect without specifying conditions that would remove the objection, the Executive Director shall initiate the consultation process pursuant to § 800.6(b).

(b) *Consultation Process.* The Agency Official, the State Historic Preservation Officer, and the Executive Director shall be the consulting parties to consider feasible and prudent alternatives to the undertaking that could avoid, mitigate, or minimize adverse effects on a National Register or eligible property. When an undertaking involves more than one Federal agency, these agencies may, upon notification to the Executive Director, coordinate their consultation responsibilities through a single lead agency. Grantees, permittees, licensees, or other parties in interest, and representatives of national, State, or local units of government, and public and private organizations, may be invited by the consulting parties to participate in the consultation process.

(1) *Preliminary Case Report.* The Agency Official shall provide copies of the report to the consulting parties at the initiation of the consultation and make it readily available for public inspection.

(2) *On-site inspection.* At the request of any of the consulting parties, the Agency Official shall conduct an on-site inspection.

(3) *Public Information Meeting.* At the request of any of the consulting parties, the Executive Director shall conduct a meeting open to the public, where representatives of national, State, or local units of government, representatives of public or private or-

ganizations, and interested citizens [illegible] receive information and express views on the undertaking, its effect on the National Register or eligible property, and alternate courses of action that could avoid, mitigate, or minimize any adverse effects on such properties. The Agency Official shall provide adequate facilities for the meeting near the site of the undertaking and shall afford appropriate notice to the public, generally at least 15 days in advance of the meeting.

(4) *Consideration of Alternatives.* Upon review of the proposed undertaking and after any on-site inspection or public information meeting, the consulting parties shall determine whether there are feasible and prudent alternatives to avoid the adverse effects on National Register or eligible property. If the consulting parties cannot agree on an alternative to avoid, they shall consult further to determine if there are alternatives that could satisfactorily mitigate the adverse effects.

(5) *Avoidance or Satisfactory Mitigation of Adverse Effect.* If the consulting parties agree upon a feasible and prudent alternative to avoid or satisfactorily mitigate the adverse effects of the undertaking on the National Register or eligible property, they shall execute a Memorandum of Agreement in accordance with [illegible](c) specifying how the undertaking will proceed to avoid or mitigate the adverse effect.

(6) *Acceptance of Adverse Effect.* If the consulting parties determine that there are no feasible and prudent alternatives that could avoid or satisfactorily mitigate the adverse effects and agree that it is in the public interest to proceed with the proposed undertaking, they shall execute a Memorandum of Agreement in accordance with § 800.6(c) acknowledging this determination and specifying any recording, salvage, or other measures to minimize the adverse effects that shall be taken before the undertaking proceeds.

(7) *Failure to Agree.* Upon the failure of the consulting parties to agree upon the terms for a Memorandum of Agreement, or upon notice of such failure by any of the consulting parties to the Executive Director, the Executive Director shall notify the Chairman within fifteen days and shall recommend whether or not the matter should be scheduled for consideration at a Council meeting. The Agency Official and the State Historic Preservation Officer shall be notified in writing of the Executive Director's recommendation.

(c) *Memorandum of Agreement*—(1) *Preparation of Memorandum of Agreement.* It shall be the responsibility of the Executive Director to prepare each Memorandum of Agreement required under these regulations. Unless otherwise requested by the Executive Director, the Agency Official shall prepare a proposal for inclusion in the Agreement that details the actions agreed upon by the consulting parties to be taken to avoid, satisfactorily mitigate, or accept the adverse effects on the property. The State Historic Preservation Officer's written concurrence shall be included in this proposal by the Agency Official. If the Executive Director determines that the proposal represents the agreement of the consulting parties, he shall within 10 days forward it as a Memorandum of Agreement to the Chairman for ratification pursuant to § 800.6(c)(2). If the Executive Director determines that the proposal does not adequately represent the agreement reached by the consulting parties, it may be returned to the Agency Official, or a Memorandum of Agreement revising the proposal may be submitted to the Agency Official and the State Historic Preservation Officer. As appropriate other parties in interest may be invited by the consulting parties to indicate their concurrence with the proposal or to be a signatory to the Agreement.

(2) *Review of Memorandum of Agreement.* Upon receipt of an executed Memorandum of Agreement, the Chairman shall institute a 30-day review period. Unless the Chairman notifies the Agency Official that the matter has been placed on the agenda for consideration at a Council meeting, the Agreement shall become final when ratified by the Chairman or upon the expiration of the 30-day review period with no action taken. Copies will be provided to signatories and notice of executed Memoranda of Agreement shall be published in the FEDERAL REGISTER. The Memorandum of Agreement shall be included in the final environmental impact statement prepared pursuant to the National Environmental Policy Act.

(3) *Effect of Memorandum of Agreement.* Agreements duly executed in accordance with these regulations shall constitute the comments of the Council and shall evidence satisfaction of the Federal agency's responsibilities for the proposed undertaking under Section 106 of the Act, Section 2(b) of the Executive Order, and these regulations. Failure to carry out the terms of a Memorandum of Agreement requires that the Federal agency again request the Council's comments in accordance with these regulations. In such instances, until the Council issues its comments under these regulations the Agency Official shall not take or sanction any action or make any irreversible or irretrievable commitment that could result in an adverse effect with respect to National Register or eligible properties covered by the Agreement or that would foreclose the Council's consideration of modifications or alternatives to the proposed undertaking that could avoid or mitigate the adverse effect.

(4) *Amendment of a Memorandum of Agreement.* If a signatory determines that the terms of the Memorandum of Agreement cannot be met or believes a change is necessary, the signatory shall immediately request the consulting parties to consider an amendment of the Agreement. Amendments will be executed in the same manner as the original Agreement.

(5) *Report on Memorandum of Agreement.* Within 90 days after carrying out the terms of the Agreement, the Agency Official shall report to all signatories on the actions taken.

(d) *Council Meetings.* The Council does not hold formal administrative hearings to develop its comments under these regulations. Reports and statements will be presented to the Council in open session in accordance with a prearranged agenda. Regular meetings of the Council generally occur quarterly.

(1) *Response to Recommendation for Consideration at Council Meeting.* Upon receipt of a notice and recommendation from the Executive Director concerning consideration of a proposed undertaking at a Council meeting, the Chairman shall determine within 15 days whether or not the undertaking will be considered and shall notify the Executive Director, the Agency Official and the State Historic Preservation Officer of his decision. The Agency Official shall and the State Historic Preservation Officer should provide such reports and information as may be required to assist the Chairman in this determination.

If the Chairman decides against consideration of the undertaking at a Council meeting, a written summary of the undertaking, any recommendations for action by the Federal agency, and the decision shall be sent to each member of the Council. The Chairman shall also notify the Agency Official and the State Historic Preservation Officer and other parties in interest of the decision. If three members of the Council object within 10 days of the Chairman's decision, the undertaking shall be scheduled for consideration at a Council meeting. Unless three members of the Council object, the chairman shall notify the Agency Official, the State Historic Preservation Officer, and other parties in interest in writing that the undertaking may proceed. Such notice shall be evidence of satisfaction of the Federal agency's responsibilities for the proposed undertaking under Section 106 of the Act, Section 2(b) of the Executive Order, and these regulations.

(2) *Decision to Consider the Undertaking.* When the Council will consider an undertaking at a meeting, the Chairman shall either designate five members of a panel to hear the matter on behalf of the full Council, or schedule the matter for consideration by the full Council.

(i) A panel shall consist of three non-Federal members, one as Chairman, and two Federal members, neither of whom shall represent the Federal agency involved in the undertaking. The panel shall meet to consider the undertaking within 30 days of the Chairman's decision unless the Agency Official agrees to a longer time.

(ii) The full Council will consider an undertaking at the next regularly scheduled meeting and no less than 60 days from the date of the Chairman's decision. In exceptional cases the Chairman may schedule the matter for consideration at a special meeting of the full Council to be held less than 60 days from the date of the decision.

(iii) Prior to any panel or full Council consideration of a matter, the Chairman will notify the Agency Official and the State Historic Preservation Officer, and other parties in interest of the date on which the undertaking will be considered. The Executive Director, the Agency Official, and the State Historic Preservation Officer shall prepare reports in accordance with § 800.13. Reports required from the Agency Official and the State Historic Preservation Officer must be received by the Executive Director at least 21 days before any meeting. Failure by the Federal agency to submit its report may result in postponement of consideration of the undertaking.

(3) *Meeting Notice.* Generally, 21 days notice of all meetings involving Council review of undertakings in accordance with these regulations shall be given by publication in the FEDERAL REGISTER. In exceptional cases, no less than 7 days notice shall be given by publication in the FEDERAL REGISTER.

(4) *Statements to the Council.* An agenda shall provide for oral statements from the Executive Director; the Agency Official; other parties in interest; the Secretary of the Interior; the State Historic Preservation Officer; representatives of national, State, or local units of government, and interested public and private organizations and individuals. Parties wishing to make oral remarks should notify the Executive Director at least two days in advance of the meeting. Parties wishing to have their statements distributed to Council members prior to the meeting should send copies of the statements to the Executive Director at least 7 days in advance.

(5) *Comments of the Council.* The written comments of the Council will be issued within 15 days after a meeting. Comments shall be made to the head of the Federal agency requesting comment or having responsibility for the undertaking. Immediately after the comments are made to the Federal agency, the comments of the Council will be forwarded to the President and Congress as a special report under authority of Section 202(b) of the Act and a notice of availability will be published in the FEDERAL REGISTER. The comments of the Council shall be available to the State Historic Preservation Officer, other parties in interest, and the public upon receipt of the comments by the head of the Federal Agency. The comments of the Council should be included in the final environmental impact statement prepared pursuant to the National Environmental Policy Act.

(6) *Review of Panel Decision.* Upon receipt of the panel's comments after a meeting, the head of the Federal agency shall take these comments into account in reaching a decision in regard to the proposed undertaking. If the agency determines not to follow the panel's comments, the Agency Official shall immediately provide written notice of this decision to the Council. The Chairman may convene a meeting of the full Council to consider the matter within 30 days of receipt of such notice. In the interim period the Agency Official shall not take or sanction any action or make any irreversible or irretrievable commitment that could result in an adverse effect on the National Register or eligible property or that would foreclose the Council's consideration of modifications or alternatives to the proposed undertaking that could avoid or mitigate the adverse effect. If the Chairman decides against consideration of the proposed undertaking, the consulting parties shall be immediately notified and the undertaking may proceed.

(7) *Agency Action in Response to Council Comments.* Upon receipt of the Council's comments after a meeting, the head of the Federal agency shall take these comments into account in reaching a final decision in regard to the proposed undertaking. When a final decision regarding the proposed undertaking is reached by the Federal agency, the Agency Official shall submit a written report to the Council describing the actions taken by the Federal Agency in response to the Council's comments; the actions taken by other parties pursuant to the actions of the Federal Agency; and the effect that such actions will have on the affected National Register or eligible property. Receipt of this Report by the Chairman shall be evidence that the agency has satisfied its responsibilities for the proposed undertaking under Section 106 of the Act. Section 2(b) of the Executive Order and these regulations. The Council may issue a final report to the President and Congress under authority of Section 202(b) of the Act describing the actions taken by the agency in response to the Council's comments including recommendations for changes in Federal policy and programs, as appropriate.

(8) *Continuing Review Jurisdiction.* When the Council has met and commented upon an undertaking that will require subsequent site-specific undertakings by a Federal agency, the Council's comment extends only to the undertaking as reviewed. The Agency Official shall ensure that subsequent actions related to the undertaking that have not been considered by the Council will be submitted to the Council for review in accordance with these regulations.

§ 800.7 *Resources discovered during construction.*

(a) *Federal Agency Responsibilities.* If a Federal agency has previously met its responsibilities for identified National Register and eligible properties under Section 106 of the Act, Section 2(b) of the Executive Order, these regulations, and the National Environmental Policy Act (42 U.S.C. 4321 et seq.), and an Agency Official finds or is notified after contruction has started that an undertaking will have an effect on a previously unidentified National Register or eligible property, the Federal agency may fulfill its responsibilities under Section 106 of the Act, Section 2(b) of the Executive Order, and these regulations, by complying with the requirements of the Archeological and Historic Preservation Act (16 U.S.C. 469(a)) as implemented by the Secretary, unless the Secretary determines that the significance of the property, the effect, and any proposed mitigation actions warrant Council consideration. If the Secretary determines the Council's comments are warranted, the Agency Official shall request the comments of the Council.

(b) *Council Comments.* Within 30 days of receipt of a request for comments from an Agency Official under this section, the Executive Director, with the concurrence of the Chairman, shall transmit comments on behalf of the Council to the Agency Official or the Chairman shall convene a meeting of the Council pursuant to § 800.6.

FEDERAL PROGRAM COORDINATION

§ 800.8 *Programmatic Memoranda of Agreement.*

(a) *Application.* At the request of an Agency Official, the Council will consider execution of a Programmatic Memorandum of Agreement to fulfill

an agency's responsibilities under Section 106 of the Act and Section 2(b) of Executive Order for a particular program or class of undertakings that would otherwise require numerous individual requests for comments under these regulations. Within 30 days after the request, the Executive Director will notify the agency official whether a Programmatic Memoranda of Agreement may be used. Generally, Programmatic Memorandum of Agreement may be used in the following types of situations:

(1) Non-site-specific undertakings, including Federal approval of State plans pursuant to Federal legislation, development of comprehensive or area-wide plans, agency recommendations for legislation, and the establishment or modification of regulations and planning guidelines.

(2) Undertakings that are repetitive in nature and have essentially the same effect on National Register or eligible properties.

(3) Programs that are designed to further the preservation and enhancement of National Register or eligible properties.

(4) Programs with statutory time limits for project application and approval that would not permit compliance with these regulations in the normal manner.

(b) *Consultation Process.* Upon determination by the Executive Director that a Programmatic Memorandum of Agreement is appropriate, the Agency Official and the Executive Director shall consult to develop a Programmatic Memorandum of Agreement. When the Agreement will affect a particular State or States, the appropriate State Historic Preservation Officer may be a party to the consultation. When the Agreement involves issues national in scope, the President of the National Conference of State Historic Preservation Officers or a designated representative may be a party to the consultation. The Executive Director may invite other parties, including other Federal agencies with responsibilities which may be affected by the Agreement, to participate in the consultation and may hold a Public Information Meeting (see § 800.6(b)(3)) on the proposed Agreement.

(c) *Preparation of the Agreement.* It shall be the responsibility of the Executive Director to prepare each Agreement. At least 30 days before executing an Agreement, the Council shall publish notice of the proposed Agreement in the FEDERAL REGISTER inviting comments from Federal, State, and local agencies and the public. The Council will make copies available to interested parties and to appropriate A-95 clearinghouses.

Execution of the Agreement. After consideration of comments received and completion of any necessary revisions, the Executive Director, the Agency Official, and other parties, if appropriate, shall sign the Agreement and it shall be sent to the Chairman for ratification.

(e) *Chairman's Review.* Upon receipt of a signed Agreement, the Chairman shall review the Agreement and within 30 days shall take one of the following actions:

(1) Ratify the Agreement, at which time it will take effect.

(2) Submit the Agreement to the full Council for approval.

(3) Disapprove the Agreement.

(f) *Effect of the Agreement.* An approved Programmatic Memorandum of Agreement shall constitute the comments of the Council on all individual undertakings carried out pursuant to the terms of the Agreement and, unless otherwise provided by the Agreement, shall satisfy the agency's responsibilities under Section 106 of the Act, Section 2(b) of the Executive Order, and these regulations for all undertakings carried out in accordance with the Agreement.

(g) *Notice.* Notice of an approved Programmatic Agreement shall be published by the Council in the FEDERAL REGISTER. Copies shall be distributed through appropriate A-95 clearinghouses and the consulting parties shall make copies readily available to the public. The Programmatic Memorandum of Agreement should be included in the final environmental impact statement prepared pursuant to the National Environmental Policy Act.

(h) *Term.* Unless otherwise provided by the Agreement, duly executed Programmatic Memorandum of Agreement shall remain in effect until revoked by any one of the signatories. The Agency Official shall submit a report annually to the Executive Director and other signatories on all actions taken pursuant to the Agreement, including any recommendations for modification or termination of the Agreement. The Executive Director and other signatories shall review the report and determine whether modification or termination of the Agreement is appropriate.

§ 800.9 Coordination With Agency Requirements Under the National Environmental Policy Act (42 U.S.C. 4321 et seq.).

Section 101(b)(4) of the National Environmental Policy Act (NEPA) declares that one objective of national environmental policy is to "preserve important historic, cultural, and natural aspects of our national heritage and maintain, wherever possible, an environment which supports diversity and variety of individual choice." In order to meet this objective, Federal agencies should coordinate NEPA compliance with the separate responsibilities of the National Historic Preservation Act and Executive Order 11593 to ensure that historic and cultural properties are given proper consideration in the preparation of environmental assessments and environmental impact statements. Agency obligations pursuant to the National Historic Preservation Act and Executive Order 11593 are independent from NEPA requirements and must be complied with even when environmental impact statement is not required. Agencies should also be aware that the threshold for compliance with Section 106 and the Executive Order is less than that for preparation of an environmental impact statement. The former applies to any Federal, federally assisted or federally licensed undertaking having an effect on a National Register or eligible property, while the latter extends only to major Federal actions significantly affecting the human environment. Where both NEPA and the Act or Executive Order are applicable, Council on Environmental Quality, in its National Environmental Policy Act—Regulations (40 CFR 1502.25), directs that draft environmental impact statements prepared under Section 102(2)(C) of NEPA shall, to the fullest extent possible, be prepared with and integrated with other environmental impact analyses and related surveys and studies required by other authorities—such as the National Historic Preservation Act and Executive Order 11593. Preparation of a draft environmental impact statement may fulfill the requirements for records and documentation under these authorities.

Circulation of the statement for comment pursuant to Section 102(2)(C) of NEPA shall constitute a request for Council comments under Section 800.4 of these regulations if Federal agencies so request in cover letters circulated with draft environmental impact statements. To coordinate the independent responsibilities of the Act and NEPA, Federal agencies should undertake compliance with these regulations whenever National Register or eligible properties may be affected by an undertaking. The following subsections indicate the appropriate means of coordinating the substance and timing of agency compliance with NEPA, Section 106, and Section 2(b). The Council will review agency environmental impact statements in accordance with this section. Adherence to these provisions will provide Federal agencies with an adequate record of the consideration of National Register and eligible properties during the planning process and will facilitate the production of a single document to meet the require-

ments of NEPA. Section 106. Executive Order 11593, and these regulations.

(c) It is normally intended that the Section 106/Executive Order commenting period run concurrently with the NEPA review process. Initiation of the consideration of historic and cultural resources should coincide with the initiation of other environmental reviews. To the maximum extent possible, agencies should reflect the status of compliance with Section 106, the Executive Order, and these regulations in all documents prepared under NEPA (environmental assessments, draft environmental impact statements, and final environmental impact statements) to provide the public with the fullest and most complete information available on effects on historic and cultural resources and alternatives to reduce those effects. If the commenting process under Section 106 and the Executive Order is not completed before the final environmental impact statement is issued, as with undertakings where subsequent design stage reviews occur, agencies should include the council's comments in any supplemental statement that is prepared pursuant to NEPA.

(b) Federal agencies should initiate compliance with Section 106 of the Act and the Executive Order in accordance with these regulations during initial environmental assessments that are undertaken to meet the requirements of NEPA and agency environmental procedures. In any event, this should occur no later than during the preparation of the draft environmental impact statement. Identification of National Register and eligible properties should be carried out in accordance with § 800.4 of these regulations. Potential effects should then be evaluated in accordance with the Criteria of Effect and Adverse Effect in § 800.3 of these regulations. The environmental assessment and the draft environmental impact statement should fully describe any National Register or eligible properties within the area of the undertaking's potential environmental impact and the nature of the undertaking's effect on them.

(c) If evaluation of the effect resulted in a Determination of No Effect or No Adverse Effect under § 800.4, that finding, along with supporting documentation, should be included or referenced in the environmental assessment and the draft environmental impact statement.

(d) If evaluation of the effect resulted in a Determination of Adverse Effect, that finding and a copy of the agency's request for the Council's comments in accordance with § 800.6(d)(1) of these regulations should be included in or referenced in the environmental assessment and the draft environmental impact statement. Agencies should include all available relevant information on National Register and eligible properties, the effects of the undertaking and alternative courses of action so that the draft environmental impact statement can be submitted as the preliminary case report under § 800.13(b) of these regulations. In some instances, the Section 106/Executive Order commenting process will be completed prior to issuance of a draft environmental impact statement. In that event, the comments of the Council should be included in the draft.

(e) Completion of the Council commenting process in accordance with these regulations should precede issuance of the final environmental impact statement. Comments of the Council obtained pursuant to § 800.6 or § 800.8 of these regulations should be incorporated into the final statement.

(f) The Council, in its review of environmental impact statements for undertakings that affect National Register or eligible properties, will look for evidence of proper compliance with Section 106 of the Act, Section 2(b) of the Executive Order, and these regulations. The Council's views on the agency's compliance with those authorities will be included in its comments on environmental impact statements.

§ 800.10 Coordination with the Presidential Memorandum on Environmental Quality and Water Resources Management.

Federal Agencies with water resources responsibilities shall, not later than three months after publication of these regulations as finally adopted in the FEDERAL REGISTER, publish procedures to implement these regulations as required by the Presidential Memorandum on Environmental Quality and Water Resources Management. Each agency shall consult with the Council while developing its procedures and shall provide an opportunity for public review and comment on their proposed regulations. Agency procedures shall be effective when the Chairman approves them as conforming to the Presidential Memorandum and these regulations. Agency procedures must at a minimum include acceptable measures to prevent or mitigate losses of historic or cultural resources and provisions to insure that all projects not yet constructed will comply with these regulations. Additionally, such procedures shall prescribe a clear way to identify funding for environmental mitigation in an agency's appropriation requests. The procedures shall be approved by the Chairman within 60 days if they are consistent with these regulations. Once in effect they shall be filed with the Council and made readily available to the public. Agencies are also encouraged to publish explanatory guidance for the procedures.

§ 800.11 Counterpart regulations.

Individual Federal agencies may, in accordance with Section 1(3) of the Executive Order, the President's Memorandum on Environmental Quality and Water Resources Management, and these regulations, choose to adopt counterpart regulations related to their specific programs and authorities to assist in meeting their responsibilities under Section 106 of the Act and Section 2(b) of the Executive Order.

(a) Responsibilities of individual Federal agencies pursuant to § 800.4 may be met by counterpart regulations jointly drafted by that agency and the Executive Director and approved by the Chairman. The Federal agency shall provide ample opportunity for public participation in the development of such counterpart regulations, including publication in the FEDERAL REGISTER as proposed and final rule making with provision for a minimum 60 day period for public comment. Once in effect such counterpart regulations may, as appropriate, supercede the requirements of § 800.4. The Federal agency shall file approved counterpart regulations with the Council and shall make them readily available to the public.

(b) Counterpart regulations may include:

(1) A definition of undertaking as it applies to that agency's particular activities and programs.

(2) Methods to identify National Register and eligible properties for each class of undertakings.

(3) Methods to evaluate effects on National Register or eligible properties.

(4) Authorization for non-Federal participation in the consultation process, and

Standards, guidelines and other measures to ensure avoidance or mitigation of adverse effects on National Register and eligible properties for each class of undertakings.

(c) To the maximum extent possible, counterpart regulations developed pursuant to this section should be integrated with agency regulations for the National Environmental Policy Act.

OTHER PROVISIONS

§ 800.12 Investigation of threats to National Register and eligible properties.

(a) The Council is frequently advised by State Historic Preservation Officers and others of undertakings that threaten National Register or eligible properties and that appear to involve a Federal agency. In order to protect

these properties, the Executive Director investigates these matters, generally by writing to the Federal agency that appears to be involved in the undertaking. Federal agencies should respond to these inquiries within 30 days. If there is Federal involvement in the undertaking, the agency shall fulfill its responsibilities under these regulations.

(b) The Council will exercise its authority to comment to Federal agencies under these regulations in certain special situations even though written notice that an undertaking will have an adverse effect has not been received.

§ 800.13 Reports to the Council.

In order to meet responsibilities under these regulations, the Council prescribes that certain reports and documents be made available to it. The content of such reports is set forth below. The purpose is to provide sufficient information for the Council to evaluate the significance of affected National Register and eligible properties, understand the objectives and requirements of the undertaking, assess the effect in terms of the criteria specified in these regulations, and analyze the feasibility and prudence of alternatives. The Council further recognizes that the Act requires that National Register and eligible properties shall be preserved "as a living part of community life and development" and considers those elements in an undertaking that have relevance beyond historical and cultural concerns. To assist it in weighing the public interest, the Council seeks information not only bearing upon physical, esthetic, or environmental effects but also information concerning economic, social, and other benefits or detriments that will result from the undertaking. Agencies should consider these reports in the context of their compliance with the National Environmental Policy Act and incorporate their content in environmental assessments, draft environmental impact statements and final environmental impact statements as specified in § 800.9.

(a) *Documentation for Determination of No Adverse Effect.* Adequate documentation of a Determination of No Adverse Effect pursuant to § 800.4 should include the following information:

(1) A description of the agency's involvement with the proposed undertaking with citations of the agency's program authority and applicable implementing regulations, procedures, and guidelines;

(2) A description of the proposed undertaking including, as appropriate, photographs, maps, drawings, and specifications;

(3) A list of National Register and eligible properties that will be affected by the undertaking, including a description of the property's physical appearance and significance;

(4) A brief statement explaining why each of the Criteria of Adverse Effect (See Section 800.3) was found inapplicable;

(5) Written views of the State Historic Preservation Officer concerning the Determination of No Adverse Effect, if available; and,

(6) An estimate of the cost of the undertaking, identifying Federal and non-Federal shares.

(b) *Preliminary Case Reports.* Preliminary Case Reports should be submitted with a request for comments pursuant to Section 800.4 and should include the following information:

(1) A description of the agency's involvement with the proposed undertaking with citations of the agency's program authority and applicable implementing regulations, procedures, and guidelines;

(2) The status of this project in the agency's approval process;

(3) The status of this project in the agency's National Environmental Policy Act compliance process and the target date for completion of all environmental responsibilities;

(4) A description of the proposed undertaking including, as appropriate, photographs, maps, drawings, and specifications;

(5) A description of the National Register or eligible properties affected by the undertaking, including a description of the properties' physical appearance and significance;

(6) A brief statement explaining why any of the Criteria of Adverse Effect. (See § 800.3) apply;

(7) Written views of the State Historic Preservation Officer concerning the effect on the property, if available;

(8) The views of other Federal agencies, State and local governments, and the other groups or individuals, when known;

(9) A description and analysis of alternatives that would avoid the adverse effects;

(10) A description and analysis of alternatives that would mitigate the adverse effects; and,

(11) An estimate of the cost of the undertaking, identifying Federal and non-Federal shares;

(c) *Reports for Council Meeting.* Consideration of an undertaking by either the full Council or a panel pursuant to § 800.6 is based on reports from the Executive Director, the Agency Official, the Secretary of the Interior, the State Historic Preservation Officer, and others. The reports consist of the following:

(1) *Secretary of the Interior's Report.* The report from the Secretary shall include a verification of the legal and historical status of the property and an assessment of the historical, architectural, archeological, or cultural significance of the property.

(2) *Agency Official's Report.* The report from the Agency Official requesting comments shall include a general discussion and chronology of the proposed undertaking; an account of the steps taken to comply with the National Environmental Policy Act (NEPA); any relevant supporting documentation in studies that the agency has completed; an evaluation of the effect of the undertaking upon the property, with particular reference to the impact on the historical, architectural, archeological, and cultural values; steps taken or proposed by the agency to avoid or mitigate adverse effects of the undertaking; a thorough discussion of alternate courses of action; and an analysis comparing the advantages resulting from the undertaking with the disadvantages resulting from the adverse effects on National Register or eligible properties. The Agency Official shall arrange for the submission and presentation of any report by a grantee, permittee, licensee, or other party receiving Federal assistance or approval to carry out the undertaking.

(3) *Other Federal Agency Reports.* A report from any other Federal agency involved in the undertaking or a related action that affects the property in question, including a general description and chronology of that agency's involvement and its relation to the undertaking being considered by the Council.

(4) *State Historic Preservation Officer's Report.* A report from the State Historic Preservation Officer should include an assessment of the significance of the property within the State preservation program; an evaluation of the effect of the undertaking upon the property and its specific components; an evaluation of known alternate courses of action; a discussion of present or proposed participation of State and local agencies or organizations in preserving or assisting in preserving the property; an indication of the support or opposition of units of government and public and private agencies and organizations within the State; and the recommendation of the State Historic Preservation Officer.

(5) *Executive Director's Report.* A report from the Executive Director shall include a description of the actions taken pursuant to these regulations, an evaluation of the effect of the undertaking on the property, a review of any known alternate courses of action, an analysis comparing the advantages resulting from the undertaking with the disadvantages resulting from the adverse effects on Na-

Encl. 1-14

tional Register or eligible properties and recommendations for Council action.

Other Reports. The Council will er other pertinent reports, state- s, correspondence, transcripts, minutes, and documents received from any and all parties, public or private. Reports submitted pursuant to this section should be received by the Council at least 7 days prior to a Council meeting.

§ 800.14 Supplementary Guidance.

The Executive Director may issue further guidance to interpret these regulations to assist Federal agencies and State Historic Preservation Officers in meeting their responsibilities. The guidelines are for informational purposes only and will be published in the FEDERAL REGISTER and will be readily available to the public.

§ 800.15 Public Participation.

The Council encourages maximum public participation in the review process under these regulations. The Council, Federal agencies, and State Historic Preservation Officers should seek assistance from the public including other Federal agencies, units of local and State government, public and private organizations, individuals and federally recognized Indian tribes in evaluating National Register and eligible properties, determining effect, and developing alternatives to avoid or mitigate an adverse effect. The public has considerable information available that could assist Federal agencies, the State Historic Preservation Officer and the Council in meeting their responsibilities under these regulations. The Council especially urges that Federal agencies make every effort to involve grantees, permittees, licensees, and other parties in interest in the consultation process. To this end, the Council, the Agency Official, and the State Historic Preservation Officer should:

(a) Make readily available, to the extent possible, documents, materials, and other information and data concerning the undertaking and effects on National Register and eligible properties that may be of interest to the public. Such information should be made available within the limits of the Freedom of Information Act (5 U.S.C. 552) and need not necessarily include information on budget, financial, personnel, and other proprietary matters or the specific location of archeological sites. Material to be made available to the public by the agency and the State Historic Preservation Officer should be provided to the public at the minimum cost permissible.

(b) Make the public aware of Public Information Meetings (§ 800.6(b)(3)), full or panel Council meeting (§ 800.6(d)), and the availability o other information related to th review process under these regulation such as a Determination of No Effect a Determination of No Adverse Effect a Memorandum of Agreement (Se § 800.6(c)) or a Programmatic Memo randum of Agreement (See § 800.8) The purpose of such notice is t inform persons, agencies, and organi zations that may be interested or af fected by the proposed undertaking o the opportunity to participate in th review process under these regula tions. This may include:

(1) Mailing notice to those who hav requested it on an individual under taking or Programmatic Memorandum of Agreement.

(2) Use of notice in local newspaper local media, and newsletters that ma be expected to reach potentially inter ested persons.

(3) Posting of notice on- and off-sit in the area where the undertaking i proposed to be located.

(c) Solicit relevant information from the public during the identification o National Register and eligible proper ties, the evaluation of effects, and the consideration of alternatives.

(d) Hold or sponsor public meetings on proposed undertakings and make diligent efforts to include the public.

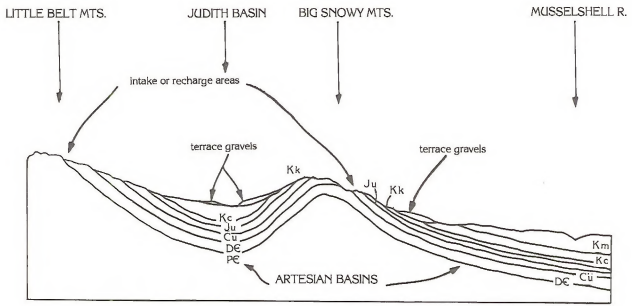
[FR Doc. 79-3248 Filed 1-29-79; 8:45 am]

APPENDIX 4.1: GENERALIZED TABLE OF GEOLOGIC FORMATIONS OF EASTERN AND CENTRAL MONTANA

SYSTEM		FORMATION	CHARACTER OF FORMATION	THICKNESS IN FEET	GROUNDWATER CONENT	QUALITY OF WATER	MAP ON PLATE
	Q U A T E R N A R Y	Alluvium	Light colored sand, gravel, and clay; dark colored silts in floodplain areas; the Most recent deposits of creeks and rivers.	1 to 50	Practically always water bearing.	Generally good; hard; varies with nearby sediments and water circulation.	
		Glacial drift	Unsorted large and small boulders embedded in sand and clay matrix. Contains many complex crystalline rocks from Canada. Extremely variable in thickness and distribution.	1 to 100 or more	Water bearing locally where thick, particularly where filling old channels.	Good; hard.	
		Late river terrace gravel	Coarse to fine gravel and sand; generally derived from formations in nearest mountains.	1 to 100	Water bearing where widespread and thick.	Good, generally hard.	
	T E R T I A R Y	Flaxville and Cypress gravels. (White River ?)	Well-rounded and polished pebbles sometimes firmly cemented. Generally derived from nearby mountains or from mountains of western Mounana.	1 to 70	Water bearing where of sufficient thickness. Flowing wells locally.	Good, generally hard.	
	?	Fort Union	Interbedded shale and yellow sandstone; sandstone massiv, fine to coarse grained, porous, arkosic; much coal and scoria. Dark shale at base (Lebo) 200-300 feet thick.	1,000 to 2,000	Abundance of water in sandstone, coal and scoria beds. Hundreds of springs. Shales carry highly mineralized water or else are dry. Flowing wells locally.	Good to fair; artesian water alkaline and soft; spring water somewhat hard.	IV
		Lance	Interbedded yellow to buff sandstone and shale; coal in upper half; sandstone coarse to fine grained, porous, soft, concretionary. Lower half (Hell Creek beds) massive, sometimes greenish, no coal.	800 to 1,500	Abundance of water in sandstone. Artesian conditions present. Hundreds of flowing wells. Many springs. Shale beds dry or yield highly mineralized water.	Good to fair; generally such mineralized, but soft and only with slight taste. Spring water somewhat hard.	V
	C R E T A C E O U S	Lance (Lennep)	Massive basal beds called Fox Hills Sand stone.				
		Bearpaw	Dark gray to black marine clay-shale; fossiliferous; concretionary.	1,000	Little or no water except in local sandstone beds.	Highly mineralized. Generally not usable.	VII
		Judith River	Upper and lower sandstone members about 200 feet each, separated by shale; sandstone members in places interbedded with shale; sandstone light to dark gray, olive-green, arkosic, fine-grained and shaley.	400 to 600	Water bearing; artesian conditions present; many flowing wells; springs.	Good near outcrop; under artesian conditions much mineralized with sodium bicarbonate and sulphate.	VIII
		Claggett	Dark gray, brownish or black marine clay-shale; somewhat similar to Bearpaw. Sands stones locally.	400 to 600	Little or no water in shale; water in sandstone.	Shale water highly mineralized. Sandstone water good.	
		Eagle	Massive gray sandstone; large iron-stained concretions; thin beds of shale. Sand stones not developed east of central Montana.	250	Abundance of water. Sometimes source of springs.	Good near outcrop. Somewhat mineralized under artesian conditions.	VIII
		(Telegraph) (Creek Form.)					
		Colorado	Dark gray to black, thin-bedded, marine shale; gypsiferous, concretionary; fossiliferous; thin sandstone members, especially near base.	2,000	Little or no water in shale; sandstone may have water.	Shale water highly mineralized and not usable. Sandstone water may be usable.	VII
	LOWER CRETACEOUS	Kootenai (Cloverly) (Dakota)	Two massive gray sandstone members separated by red and green shale. Basal sandstone particularly massive, coarse-grained or conglomeratic, porous, widespread and uniform.	300 to 500	Large amounts of water in sandstone, particularly the basal sandstone. Many large flowing wells; many springs.	Good in basal sandstone; more mineralized in upper sandstones but usable.	IX
	J U R A S S I C	Morrison	Variegated shale with beds of sandstone. Percent only in central and southern Montana.	0 to 100	Water bearing in sandstones.	Fair to good in sandstone; shale water poor or unfit.	
		Ellis	Gray and dove-colored limestone in center, gray sandstone above and below. Pink limestone in southern Montana.	100 to 400	Contains some water. Abundance of water in south Montana.	Somewhat mineralized; often "sulphur water" where deeply buried. Good water in southern Montana.	III
	TRIASSIC	Chugwater	Chiefly bright red sandstone with red shale; gypsum near top and base.	0 to 600	Prolific water producer near Big Horn Mts. only.	Good near Big Horn Mts.	IX
P A L E O Z O I C	PENNSYLVANIAN	Quadrant	Coarse, gray sandstone; red, green, and black shale; gray limestone in lower part. Absent in northern Montana.	500 60 1,000	Sandstone waterbearing Some large flowing wells and springs.	Good water from sandstone. "Sulphur water" in places.	III
	MISSISSIPPIAN	Madison	Massive, gray or white crystalline limestone; shaley and sandy near base.	1,000 to 1,500	Water in fissures or solution cavities.	Mineralized; fair to unfit; often "sulphur water."	III
	DEVONIAN AND SILURIAN	Jefferson Gallatin Flathead	Mainly massive limestone; quartzite at base. Found only near centers of mountain uplifts. Not reached by drilling in plains regions.	2,000	Shallow groundwater in mountain areas; little or no water where deeply buried.	Shallow water satisfactory in mountain area.	III

SOURCE: Eugene S. Parry, Groundwater in Eastern Montana and Central Montana (Butte, Montana: Montana School of Mines, 1931) p. 12.

APPENDIX 4-2: CROSS SECTION OF A PORTION OF CENTRAL MONTANA SHOWING HOW GEOLOGIC STRUCTURES AFFECT OCCURRENCE OF GROUNDWATER



Km - Montana group
Kc - Colorado group
Kk - Kootenai fm.
Ju - Jurassic undifferentiated
Cu - Carboniferious undifferentiated
DЄ - Devonian and Cambrian
PЄ - Precambrian

Source: Montana Bureau of Mines and Geology
Information Circular 26, Plate 6

GRASS AND GRASSLIKE

Common Name	Scientific Name	Common Name	Scientific Name
Carolina foxtail	*Alopecuras carolinianus*	Russian wildrye	*Elymus junceus*
Redtop	*Agrostis alba*	Idaho fescue	*Festuca octoflora*
Bluebunch wheatgrass	*Agropyron spicatum*	Six weeks fescue	*Festuca octoflora*
Crested wheatgrass	*Agropyron cristatum*	Foxtail barley	*Hordeum jabatum*
Thickspike wheatgrass	*Agropyron dasystachyum*	Spikerush	*Juncus spp*
Western wheatgrass	*Agropyron smithii*	Prairie junegrass	*Koeleria cristata*
Slender wheatgrass	*Agropyron trachycaulum*	Plains muhly	*Muhlenbergia cuspidata*
Little bluestem	*Andropogon scoparius*	Mat muhly	*Muhlenbergia richardsonis*
Red threeawn	*Aristida longiseta*	Indian ricegrass	*Oryzopsis hymenoides*
American sloughgrass	*Bechmannia syzigachne*	Big bluegrass	*Poa ampla*
Blue grama	*Bouteloua gracilis*	Canby bluegrass	*Poa cambyi*
Smooth brome	*Bromus inermis*	Kentucky bluegrass	*Poa pratensis*
Japanese brome	*Bromus japonicus*	Sandberg bluegrass	*Poa secunda*
Cheatgrass	*Bromus tectorum*	Tumblegrass	*Schedonnardus panculatus*
Bluejoint	*Calamgrostis canadensis*	Bullrush	*Scirpus spp*
Plains reedgrass	*Calamagrostis montanensis*	Squirrel tail	*Sitanian hystrix*
Prairie sandreed	*Calamovilfa longfolia*	Dropseed	*Sporobolus spp*
Sedge	*Carex spp*	Alkali sacaton	*Sporobolus arioides*
Threadleaf sedge	*Carex filifolia*	Alkali cordgrass	*Spartina gracilis*
Elk sedge	*Carex geyeri*	Needleandthread	*Stipa comata*
Needleleaf sedge	*Carex stenophylla*	Green needlegrass	*Stipa viridula*
Hair grass	*Deschampsia spp*	Porcupine grass	*Stipa spartea*
Inland saltgrass	*Distichlis stricta*	Common wheat	*Triticum aestivum*
Barnyard grass	*Echinochloa crusgalli*	Broadleaf cattail	*Typha spp.*
Canada wildrye	*Elymus canadensis*	Nodding smartweed	*Polygonum muhlenbergii*
		Sago pond weed	*Potamogeton pectinatus*

HALF SHRUB AND FORB

Wavyleaf thistle	*Cirsium undulatum*	Yarrow	*Achillea lanulosa*
Field bindweed	*Convolvulus arvensis*	Western yarrow	*Archillea millefolium*
Bull thistle	*Cirsium vulgare*	Kinnikinnick	*Arctostaphylos uva-ursi*
Narrowleafed collomia	*Collomia linearis*	Broadleaf water plantain	*Aliasma plantago acquatica*
Bastard toadflax	*Comandra umbellata*	Nodding onion	*Allium cernuum*
Minerscandle	*Cryptantha bradburiana*	Wild onion	*Allium textile*
Hawksbeard	*Crepis spp*	Field pussytoes	*Antennaria neglecta*
Larkspur	*Delphinium spp*	Rose pussytoes	*Antennaria rosea*
Shootingstar	*Dodecatheon conjugens*	Fringed sagewort	*Artemisia frigida*
Horsetail	*Equisetum spp*	Green sagewort	*Artemisia dracunculus*
Plains (western) wallflower	*Erysimum asperum*	Cudweed sagewort	*Artemisia ludoviciana*
Fleabane	*Erigeron spp*	Heartleaf arnica	*Arnica sororia*
Fernleaf fleabane	*Erigeron compositus*	Spreading pasqueflower	*Anemone patens*
Buckwheat	*Erigonium lagopus*	Loco weed	*Astragalus spp*
Eriogonum (buckwheat)	*Eriogonum spp*	Pursh loco (wooly pod)	*Astragalus purshii*
Low fleabane	*Erigeron pumilus*	Green milkweed	*Asclepias Viridiflora*
Leafy spurge	*Euphorbia esula*	Milkweed species	*Asclepias spp*
Yellowbell	*Fritillaria pudica*	Aster spp	*Aster spp*
Brown-eyed Susan	*Gaillardia aristata*	Many flowered aster	**Aster ericoides*
Bedstraw	*Gallium boreale*	Oregon grape	*Berberis repens*
Scarlet gaura	*Gaura coccinea*	Roundleaf harebell	*Campanula rotundifolia*
White geranium	*Geranium richardsonii*	Field chickweed	*Cerastium arvense*
Prairiesmoke	*Geum triflorum*	Lambsquarter	*Chenopodium album*
American locorice	*Glycyrrhiza lepidota*	Hairy goldenaster	*Chrysopsis villosa*
Curly cup gumweed	*Grindelia squarrosa*	Thistle	*Cirsium spp*
Broom snakeweed	*Gutierrezia sarothrae*	Canada thistle	*Cirsium arvense*
Stickseed	*Hackelia spp*		

* Species unlisted in Standardized Plant Names for Montana

HALF SHRUB and FORB cont.

Common Name	Scientific Name	Common Name	Scientific Name
Halogeton	*Halogeton glormeratus*	Aquatic buttercup	*Ranunculus spp.*
Sun flower	*Halianthella spp*	Buttercup	*Ranunculus abortivus*
Annual sunflower	*Helianthus annuus*	Sagebrush buttercup	*Ranunculus glaberrimus*
Stiff sunflower	*Helianthus rigidus*	Prairie coneflower	*Ratibida columnifera*
Sternless hymenoxys	*Hymenoxys acaulis*	Raspberry	*Ropippa calycina*
Hymenoxys	*Hymenoxys spp*	Dock	*Rumex spp*
Pingue humenoxys	*Hymenoxys richardsonii*	Arrowhead	*Sagittaria latifolia*
Poverty weed	*Iva axillaris*	Russian thistle	*Salsola kali tenuuiflora*
Kochia	*Kochia americana*	Small clubmoss	*Selaginella densa*
Belvedere summercypress	*Kochia scoparia*	Grounsel	*Senecio spp*
Stickseed	*Lappula spp*	Tembleweedmustard	*Sisymbrium spp*
Dotted gay feather	*Liatris punctata*	Goldenrod	*Solidago spp*
Perennial flax	*Linum perenne*	Missouri goldenrod	*Solidago missouriensis*
Biscuitroot	*Lomatium foeniculaceum*	Stiff goldenrod	*Solidago rigida*
Bigseed lomatium	*Lomatium macrocarpum*	Scarlet globemallow	*Sphaeralcea coccinea*
Lupine	*Lupinus*	Woundwort (mint)	*Stachys palustis*
Skeletonweed	*Lygodesmia spp*	Common dandelion	*Taraxacum officinale*
Rush skeletonweed	*Lygodesmia juncea*	Fanweed	*Thlaspi arvense*
Pink pincushioncactus	*Mammillaria vivipara*	Mountain thermopsis	*Thermopsis montana*
White sweetclover	*Melilotus alba*	Common salsify	*Tragopogon dubius*
Yellow sweetclover	*Melilotus officianalis*	Mustard family	*Typha latifolia*
Alfalfa	*Medicago sativa*	American vetch	*Vicia americana*
Brookmint	*Meatha canadensis*	Yellow prairie violet	*Viola nuttallii*
Microseris	*Microseris spp*	Cocklebur	*Xanthium spp*
Daggerhilt (gumbo weed)	*Monolepsis nuttalliana*	Deathcamas	*Zygadenus spp*
Wildparsley	*Musineon divaricatum*	Hoods phlox	*Phlox hoodii*
Forgetmenot	*Myosotis spp*	Wooly plantian	*Plantago patagonica*
Gumbo lily	*Oenothera caespitosa*	Spindle plantain	*Plantago patagonica*
Plains pricklypear	*Opuntia polyacantha*	(Spiny indianwheat)	*spinulosa*
Yellow owl clover	*Orthocarpus luteau*	(Wooly indianwheat)	*gnaphaloides*
Crazyweed	*Oxytropis spp*	Cinquefoil	*Potentilla spp*
White pointloco	*Oxytropis sericea*	Gland cinquefoil	*Potentilla glandulosa*
Penstemon	*Penstemon spp*	Scurfpea	*Psoralea spp*
White penstemon	*Penstem albidus*	Silverleaf scurfpea	*Psoralea argophylla*
White prairie clover	*Petalostemon candidus*	Common breadroot scurfpea	*Psoralea esculenta*
Purple prairie clover	*Petalostemon purpurcum*		

SHRUBS AND TREES

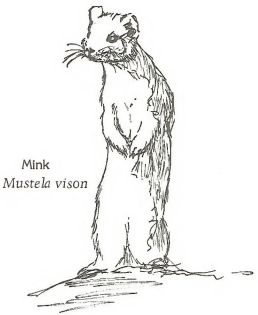
Subalpine fir	*Abies lasiocarpa*	Utah juniper	Juniperus osteosperma
Box elder	*Acernegundo*	Rocky Mountain juniper	Juniperus scopulorum
Juneberry	Amelanchier alnifolia	Englemann spruce	Picea elgelmannii
Black sage	Artemisia arbuscula var. nova	White bark pine	Pinus albicaulis
Silver sagebrush	Artemisia cana	Limber pine	Pinus flexilus
Big sagebrush	Artemisia tridentata	Lodgepole pine	Pinus contorta latifolia
Shadscale saltbush	Atriplx confertifolia	Ponderosa pine	Pinus ponderosa
Nuttall saltbush	Atriplx nattallii	Cottonwood	Populus spp
Siberian peatree	Caragana arborescens	Plains cottonwood	Populus sargentii
Curleaf mountain mahogany	Cercocarpus ledifolius	Pin cherry	Prunus pennsylvanica
Rubber rabbitbrush	Chrysothamnus nauseosus	Chokecherry	Prunus virginiana
River hawthorn	Cratargus rivularis	Douglas fir	Pseudotsuga menziesii glauca
Douglas rabbitbrush	Chrysothamnus viscidiflorus	Skunkbrush	Rhus trilobata
Green ash	Fraxinus pennsylvanica	Wild rose	Rosa spp
Winterfat	Eurotia lanata	Willow	Salix spp
Broom snakeweed	Gurierrezia sarothrae	Greasewood	Sarcobatus vermiculatus
Common juniper	Juniperus communis	Buffaloberry	Sheperdia argentea
Creeping juniper	Juniperus horizontalis	Western snowberry	Symphoricarpos occidentalis
		Yucca	Yucca glauca

Source: BLM, 1980.

WILDLIFE SPECIES IN THE LEWISTOWN DISTRICT

MAMMALS

Common Name	Scientific Name
Masked Shrew	*Sorex cinereus*
Merriam Shrew	*Sorex merriami*
Preble Shrew	*Sorex preblei*
Long-Legged Bat	*Myotis volans*
Little Brown Bat	*Myotis lucifugus*
Yuma Bat	*Myotis yumanensis*
Little Long-eared Bat	*Myotis evotis*
Small-footed Myotis	*Myotis leibii*
Big Brown Bat	*Eptesicus fuscus*
Hoary Bat	*Lasiurus cinereus*
Townsend's Big-eared Bat	*Plecotus townsendii*
Silver-Haired Bat	*Lasionycteris noctivagar*
Raccoon	*Procyon lotor*
Short-tailed Weasel	*Mustela erminea*
Long-tailed Weasel	*Mustela frenata*
Least Weasel	*Mustela rixosa*
* Black-footed Ferret	*Mustela nigripes*
Wolverine	*Gulo luscus*
Stripped Skunk	*Mephitis mephitis*
Spotted Skunk	*Spilogale putorius*
Badger	*Taxidea Taxus*



Mink
Mustela vison

River Otter *Lutra canadensis*

Red Fox	*Vulpes fulva*
Coyote	*Canis latrans*
* Gray Wolf	*Canis lupus*
Cougar	*Felis concolor*
Canada Lynx	*Lynx canadensis*
Bobcat	*Lynx rufux*
Wyoming Pocket Mouse	*Perognathus fasciatus*
Ord Kangaroo Rat	*Dipodomys ordi*
Beaver	*Castor canadensis*

Northern Grasshopper Mouse	*Onychomys leucogaster*
Western Harvest Mouse	*Reithrodontomys megalotis*
Western Deer Mouse	*Peromyscus maniculatus*
White-footed Mouse	*Peromyscus leucopus*
Columbian Ground Squirrel	*Spermophilus columbianus*
Richardson Ground Squirrel	*Spermophilus richardsonii*
Thirteen-line Ground Squirrel	*Spermophilus tridecemlineatus*
Black-tailed Prairie Dog	*Cynomys ludovicianus*
Least Chipmunk	*Eutamias minimus*
Northern Pocket Gopher	*Thomomys talpoides*
Bushy-tailed Woodrat	*Neotoma cinerea*
Meadow Vole	*Microtus pennsylvanicus*
Prairie Vole	*Microtus ochrogaster*
Sagebrush Vole	*Lagurus curtatus*
Muskrat	*Ondatra zibethica*
Montane Vole	*Microtus montanus*
House Mouse	*Mus musculus*
Western Jumping Mouse	*Zapus princeps*
Meadow Jumping Mouse	*Zapus hudsonius*
Whitetail Jackrabbit	*Lepus townsendi*
Mountain Cottontail	*Sylvilagus nuttalli*
Desert Cottontail	*Sylvilagus auduboni*
Porcupine	*Erethizon dorsatum*
Rocky Mountain Elk	*Cervus canadensis*
Mule Deer	*Odocoileus hemionus*
White-tailed Deer	*Odoncoileus virginianus*
Pronghorn Antelope	*Antilocapra americana*

* Endangered

BIRDS

Common Name	Scientific Name
Common Loon	*Gavia immer*
Red-Necked Grebe	*Podiceps grisegena*
Horned Grebe	*Podiceps auritus*
Eared Grebe	*Podiceps caspicus*
Western Grebe	*Aechmophus occidentalis*
Pied-Billed Grebe	*Podilymbus podiceps*
White Pelican	*Pelecanus erythrorhynchos*
Double-Crested Cormorant	*Phalacrocorax auritus*
Snowy Egret	*Leucophoyx thula*
Black-Crowned Night Heron	*Nycticorax nycticorax*
American Bittern	*Botaurus lentiginosus*
White-Faced Ibis	*Plegadis chihi*
Whistling Swan	*Olor columbianus*
White-Fronted Goose	*Anser albifrons*
Snow Goose	*Chen caerulescens*
Ross' Goose	*Chen rossii*
Mallard	*Anas platyrhynchos*
Black Duck	*Anas rubripes*
Gadwall	*Anas strepera*
Pintail	*Anus acuta*
Green-Winged Teal	*Anas carolinensis*
Blue-Winged Teal	*Anas discors*
Cinnamon Teal	*Anas cyanoptera*
American Wigeon	*Anas americana*

Great Blue Heron
Ardea herodias

Goshawk	*Accipiter gentilis*
Sharp-Shinned Hawk	*Accipiter striatus*
Cooper's Hawk	*Accipiter cooperi*
Red-Tailed Hawk	*Buteo jamaicensis*
Broad-Winged Hawk	*Buteo platypterus*
Harlan's Hawk	*Buteo harlani*
Swainson's Hawk	*Buteo swainsoni*
Rough-Legged Hawk	*Buteo lagopus*
Ferruginous Hawk	*Buteo regalis*
Golden Eagle	*Aquila chrysaetos*
Bald Eagle	*Haliaeetus leucocephalus*
Marsh Hawk	*Cirus cyaneus*
Prairie Falcon	*Falco mexicanus*
Peregrine Falcon	*Falco peregrinus*

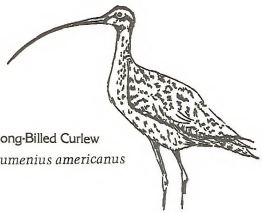
Canada Goose
Branta canadensis

Northern Shovelor	*Anas clypeata*
Wood Duck	*Aix sponsa*
Redhead	*Aythya americana*
Ring-Necked Duck	*Aythya collaris*
Canvasback	*Aythya valisimeria*
Lesser Scaup	*Aythya affinis*
Common Goldeneye	*Bucephala clangula*
Barrow's Goldeneye	*Bucephala islandica*
Bufflehead	*Bucephala albeola*
White-Winged Scoter	*Melanitta deglandi*
Ruddy Duck	*Oxyura jamaicensis*
Hooded Merganser	*Lophodytes cucullatus*
Common Merganser	*Mergus merganser*
Red-Breasted Merganser	*Mergus serrator*

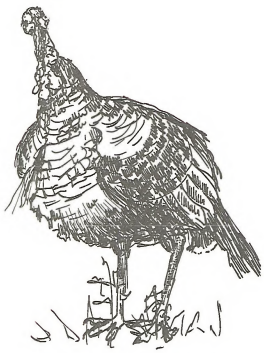
Gyr Falcon
Falco rusticolus

BIRDS CONT.

Common Name	Scientific Name
Osprey	*Pandion haliaetus*
American Kestrel	*Falco sparverius*
Merlin	*Falco columbarius*
Sharp-Tailed Grouse	*Pedioecetes phasianellus*
Sage Grouse	*Centrocercus urophasianus*
Ring-Necked Pheasant	*Phasianus colchicus*
Blue Grouse	*Dendragapus obscuris*
Ruffed Grouse	*Bonasa umbellus*



Long-Billed Curlew
Numenius americanus



Turkey *Meleagris gallopavo*

Common Name	Scientific Name
Upland Sandpiper	*Bartramia longicauda*
Solitary Sandpiper	*Tringa solitaria*
Spotted Sandpiper	*Actitis macularia*
Willett	*Catoptropherus semipalmatus*
Greater Yellowlegs	*Tringa melanoleucus*
Lesser Yellowlegs	*Tringa flavipes*
Pectoral Sandpiper	*Calidris melanotos*
White-Rumped Sandpiper	*Calidris fuscicollis*
Baird's Sandpiper	*Calidris bairdii*
Least Sandpiper	*Calidris minutilla*
Western Sandpiper	*Calidris mauri*
Short-Billed Dowitcher	*Limnodromus griseus*
Long-Billed Dowitcher	*Limnodromus scolopaceus*
Stilt Sandpiper	*Micropalma himantopus*
Semipalmated Sandpiper	*Calidris pusilla*
Marbled Godwit	*Limosa fedoa*
Sanderling	*Calidris alba*
American Avocet	*Recurvirostra americana*
Black-Necked Stilt	*Himantopus mexicanus*
Red Phalarope	*Phalaropus fulicarius*
Wilson's Phalarope	*Steganopus tricolor*
Northern Phalarope	*Lobipes lobatus*
Herring Gull	*Larus argentatus*
California Gull	*Larus californicus*
Ring-Billed Gull	*Larus delawarensis*
Franklin's Gull	*Larus pipixcan*
Bonaparte's Gull	*Larus philadelphia*
Forster's Tern	*Sterna forsteri*
Common Tern	*Sterna hirundo*
Black Tern	*Chlidonias niger*
Mourning Dove	*Zenaidura macroura*

Gray Partridge	*Perdix perdix*
Sandhill Crane	*Grus canadensis*
Whooping Crane	*Grus americana*
Virginia Rail	*Rallus limicola*
Sora	*Porzana carolina*
American Coot	*Fulica americana*
Mountain Plover	*Charadrius montana*
Semipalmated Plover	*Charadrius semipalmatus*
Piping Plover	*Charadrius melodus*
Killdeer	*Charadrius vociferus*
American Golden Plover	*Pluvialis dominica*
Black-Bellied Plover	*Squatarola squatarola*
Ruddy Turnstone	*Arenaria interpres*
Common Snipe	*Capella gallinago*

BIRDS CONT.

Common Name	Scientific Name
Rock Dove	*Columba livia*
Yellow-Billed Cuckoo	*Coccyzus americanus*
Black-Billed Cuckoo	*Coccyzus erthropthalmus*
Barn Owl	*Tyro alba*
Screech Owl	*Otus asio*
Great Horned Owl	*Bubo virginianus*
Snowy Owl	*Nyctea scandiaca*
Burrowing Owl	*Athene cunicularia*
Long-Eared Owl	*Asio otus*
Short-Eared Owl	*Asio flammeus*
Saw-Whet Owl	*Aegolius acadicus*
Poor-Will	*Phalaenoptilus nuttallii*
Common Nighthawk	*Chordeiles minor*
White-Throated Swift	*Aeronautes saxatilis*
Chimney Swift	*Chaetura pelagica*

Ruby-Throated Hummingbird
Archilochus colubris

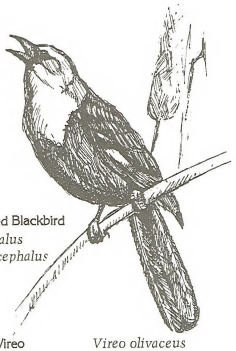
Belted Kingfisher	*Mergaceryle alcyon*
Common Flicker	*Colaptes auritus*
Red-Headed Woodpecker	*Melanerpes erythrocephalus*
Lewis Woodpecker	*Melanerpes lewis*
Yellow-Bellied Sapsucker	*Sphyrapicus varius*
Hairy Woodpecker	*Picoides villosus*
Downy Woodpecker	*Picoides pubescens*
Eastern Kingbird	*Tyrannus tyrannus*
Western Kingbird	*Tyrannus verticalis*
Scissor-tailed Flycatcher	*Muscivora forficata*
Say's Phoebe	*Sayornis saya*
Alder Flycatcher	*Empidonax alnorum*
Willow Flycatcher	*Empidonax trailli*
Least Flycatcher	*Empidonax minimus*
Dusky Flycatcher	*Empidonax oberholseri*
Western Flycatcher	*Empidonax difficilis*
Western Wood Pewee	*Contopus sordidulus*
Horned Lark	*Eremophila alpestris*
Violet-Green Swallow	*Tachycineta thalassina*

Common Name	Scientific Name
Tree Swallow	*Iridoprocne bicolor*
Bank Swallow	*Riparia riparia*
Rough-Winged Swallow	*Stelgidopteryx ruficollis*
Barn Swallow	*Hirundo rustica*
Cliff Swallow	*Petrochelidon pyrrhonota*
Purple Martin	*Progne subis*
Blue Jay	*Cyanocitta cristata*
Pinyon Jay	*Gymnorhinus cyanocephalus*
Gray Jay	*Perisoreus canadensis*
Black-Billed Magpie	*Pica pica*
Clark's Nutcracker	*Nucifraga columbiana*
Common Crow	*Corvus brachyrhynchos*
Common Raven	*Corvus corax*
Black-Capped Chickadee	*Parus atricapillus*
Mountain Chickadee	*Parus gambeli*
Dipper	*Cinclus mexicanus*
White-Breasted Nuthatch	*Sitta carolinensis*
Red-Breasted Nuthatch	*Sitta canadensis*
Brown Creeper	*Certhia familiaris*
House Wren	*Troglodytes aedon*
Long-Billed Marsh Wren	*Cistothorus palustris*
Short-Billed Marsh Wren	*Cistothorus platensis*
Rock Wren	*Salpinctes obsoletus*
Mockingbird	*Mimus polyglottus*
Gray Catbird	*Dumetella carolinensis*
Brown Thrasher	*Taxostoma rufum*
Sage Thrasher	*Oreoscoptes montanus*
American Robin	*Turdus migratorius*
Varied Thrush	*Ixoreus naevius*
Wood Thrush	*Hylocichla mustelina*
Hermit Thrush	*Catharus guttata*
Swainson's Thrush	*Catharus ustulata*
Gray-Cheeked Thrush	*Catharus minimus*
Veery	*Catharus fuscescens*
Eastern Bluebird	*Sialia sialis*

Mountain Bluebird
Sialia currucoides

BIRDS CONT.

Scientific Name	Common Name
Western Bluebird	*Sialia mexicana*
Townsend's Solitaire	*Myadestes townsendi*
Blue-Grey Gnatcatcher	*Polioptila caerulea*
Golden-Crowned Kinglet	*Regulus satrapa*



Yellow-Headed Blackbird
Xanthocephalus xanthocephalus

Red-Eyed Vireo	*Vireo olivaceus*
Warbling Vireo	*Vireo gilvus*
Black & White Warbler	*Mniotilta varia*
Tenessee Warbler	*Vermivora peregrina*
Orange-Crowned Warbler	*Vermivora celata*
Yellow Warbler	*Dendroica petechia*
Yellow-Rumped Warbler	*Dendroica coronata*
Blackpoll Warbler	*Dendroica striata*
Palm Warbler	*Dencroica pinus*
Ovenbird	*Seiurus aurocapillus*
Northern Waterthrush	*Seiurus noveboracensis*
Mourning Warbler	*Oporornis philadelphia*
McGillivray's Warbler	*Oporornis tolmiei*
Common Yellowthroat	*Geothlypis trichas*
Yellow-Breasted Chat	*Icteria virens*
Wilson's Warbler	*Wilsonia pusilla*
American Redstart	*Setophaga ruticilla*
House Sparrow	*Passer domesticus*
Bobolink	*Dolichonyx oryzivorus*
Western Meadowlark	*Sturnella neglecta*
Red-Winged Blackbird	*Agelaius phoeniceus*
Orchard Oriole	*Icterus spurius*
Northern Oriole	*Icterus galbula*
Rusty Blackbird	*Euphaga carolinus*
Brewer's Blackbird	*Euphaga cyanocephalus*
Common Grackle	*Quiscalus quiscula*
Brown-Headed Cowbird	*Molothrus ater*

Common Name	Scientific Name
Starling	*Sturnus vulgaris*
Solitary Vireo	*Vireo solitarius*
Ruby-Crowned Kinglet	*Regulus calendula*
Water Pipit	*Motacilla spinoletta*
Sprague's Pipit	*Anthus spragueii*
Bohemian Waxwing	*Bombycilla garrulus*
Western Tanager	*Piranga lucoviciana*
Rose-Breasted Grosbeak	*Pheucticus ludovicianus*
Black-Headed Grosbeak	*Pheucticus melanocephalus*
Blue Grosbeak	*Guiraca caerulea*
Evening Grosbeak	*Hesperiphona vespertina*
Pine Grosbeak	*Pinicola enucleator*
Indigo Bunting	*Passerina cyanea*
Dickcissil	*Spiza americana*
Lazuli Bunting	*Passerina amoena*
Purple Finch	*Carpodacus purpureus*
Gray-Crowned Rosy Finch	*Leucosticte tephrocotis*
Black Rosy Finch	*Leucosticte atrata*
Hoary Redpoll	*Carduelis hornemanni*
Common Redpoll	*Carduelis flammea*
Pine Siskin	*Carduelis pinus*
American Goldfinch	*Carduelis tristis*
Red Crossbill	*Loxia curvirostra*
Rufous-Sided Towhee	*Pipilo erythrophthalmus*
Green-Tailed Towhee	*Pipilo chlorurus*
Lark Bunting	*Calamospiza melanocorys*
Savannah Sparrow	*Passerculus sandwichensis*
Baird's Sparrow	*Ammodramus bairdii*
Le Conte's Sparrow	*Ammospiza leconteii*
Sharp-Tailed Sparrow	*Ammospiza caudacuta*
Vesper Sparrow	*Pooecetes gramineus*
Lark Sparrow	*Chondestes grammacus*
Dark-Eyed Junco	*Junco hyemalis*
Gray-Headed Junco	*Junco caniceps*
Tree Sparrow	*Spizella arborea*
Chipping Sparrow	*Spizella passerina*
Clay-Colored Sparrow	*Spizella pallida*
Brewer's Sparrow	*Spizella breweri*
Field Sparrow	*Spizella pusilla*
Harris' Sparrow	*Zonotriehia querula*
White-Crowned Sparrow	*Zonotrichia leucophrys*
White-Throated Sparrow	*Zonotrichia albicollis*
Fox Sparrow	*Passerella iliaca*
Lincoln's Sparrow	*Melospiza lincolnii*
Swamp Sparrow	*Melospiza georgiana*
Song Sparrow	*Melospiza melodia*
McCown's Longspur	*Calcarius mccownii*
Lapland Longspur	*Calcarius lapponicus*
Chestnut-Collared Longspur	*Calcarius ornatus*
Snow Bunting	*Plectrophenax nivalis*
Cedar Waxwing	*Bombycilla cedrorum*
Northern Shrike	*Lanius excubitor*
Loggerhead Shrike	*Lanius ludovicianus*

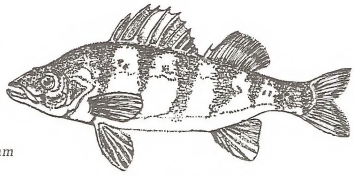
FISH

Common Name	Scientific Name
Paddlefish	*Polyodon spathula*
Goldeye	*Hiodon alosoides*
Lake Whitefish	*Coregonus clupeaformis*
*Rainbow Trout	*Salvelinus gairdner*
*Brook Trout	*Salvelinus fontinalis*
Northern Pike	*Esox lucius*
*Carp	*Cyprinus carpio*
Golden Shiner	*Notemigonus crysoleucas*
Pearl Dace	*Semotilus margarita*
Northern Redbelly Dace	*Phoxinum eos*
Finescale Dace	*Phoxinus neogaeus*
Flathead Chub	*Hybopsis gracilis*
Lake Chub	*Couesius plumbeus*
Emerald Shiner	*Notropis atherinoides*
Brassy Minnow	*Hybognathus hankinsoni*
Silvery Minnow	*Hybognathus nuchalis*
Flathead Minnow	*Pimephales promelas*
Longnose Dace	*Rhinichthys cataractae*
River Carpsucker	*Carpoides carpio*
Smallmouth Buffalo	*Ictiobus bubalus*
Bigmouth Buffalo	*Ictiobus cyprinellus*
Shorthead Redhorse	*Moxostoma macrolepidotum*
Longnose Sucker	*Catostomus catostomus*
White Sucker	*Catostomus commersoni*
*Black Bullhead	*Ictalurus melas*
Channel Catfish	*Ictalurus punctatus*
Stone Cat	*Noturus flavus*
Burbot (Ling)	*Lota lota*
Brook Stickleback	*Culaea inconstans*
*Pumpkinseed	*Lepomis gibbosus*
*Bluegill	*Lepomis mackochirus*
*Largemouth Bass	*Micropterus salmoides*
*White Crappie	*Pomoxis annularis*
*Black Crappie	*Pomoxis nigromaculatus*
Sauger	*Stizostedion canadense*
*Walleye	*Stizostedion vitreum*
Iowa Darter	*Etheostoma exile*
Mottled Sculpin	*Cottus bairdi*
*Smallmouth Bass	*Micropterus dolomieui*
Mountain Whitefish	*Prosopium williamsoni*
Freshwater Drum	*Aplodinotus grunniens*
Shovelnose Sturgeon	*Scaphirhynchus platorynchus*
*Brown Trout	*Salmo trutta*
*Goldfish	*Carassius auratus*
Plains Minnow	*Hybognathus placitus*
Blue Sucker	*Cycleptus elongatus*
Mountain Sucker	*Catostomus platyrhynchus*
*Mosquitofish	*Gambusia affinis*
*White Bass	*Roccus chrysops*
American Smelt	*Osmerus Mordax*

*Introduced species.

AMPHIBIANS

Common Name	Scientific Name
Plains Spadefoot	*Scaphiopus bombifrons*
Great Plains Toad	*Bufo cognatus*
Dakota Toad	*Bufo hemiopheys*
Rocky Mountain Toad	*Bufo woodhousei*
Boreal Chorus Frog	*Psendacris triseriata*
Leopard Frog	*Rana pipiens*
Tiger Salamander	*Ambystoma tigrinum*



*Yellow Perch
Perca flavescens

REPTILES

Common Name	Scientific Name
Prairie Rattlesnake	*Crotalus viridis*
Bull Snake	*Pituophis catenifer*
*Plains Hognose Snake	*Heterodon nasicus*
Racer	*Coluber constrictor*
Western Garter Snake	*Thamnophis elegans*
Plains Garter Snake	*Thamnophis radix*
Common Garter Snake	*Thamnophis sirtalis*
Painted Turtle	*Chrysemys picta*
*Western Spiny Softshell	*Trionyx spiniferus*
Short-horned Lizard	*Phrynosoma douglassi*
Sagebrush Lizard	*Sceloporus graciosus*
*Milk Snake	*Lampropeltis doliata*
*Common Snapping Turtle	*Chelydra serpentina*

APPENDIX 4.5: COMMUNITIES' ABILITIES TO ABSORB ADDITIONAL POPULATION

This social and economic inventory and analysis focuses upon those areas within the Lewistown District which have experienced oil and gas activity in the past or which could be expected to experience impacts in the future because of the proximity of structures known to contain oil and gas resources (i.e., KGSs). Consequently, the largest community within each county within commuting distance of existing or potential oil/gas fields was contacted in order to determine the adequacy of each community's infrastructure and their overall capacity to absorb additional population through the use of current excess public service and housing capacity or planned increases in service capacity.

This assessment was based upon a telephone survey of either the mayor or city clerk and recorder in each of the following communities:

Community	County
Plentywood (2,382)	Sheridan (5,019)
Wolf Point (3,183)	Roosevelt (10,761)
Scobey (1,493)	Daniels (3,023)
Glasgow (5,823)	Valley (14,433)
Malta (2,423)	Phillips (5,501)
Chinook (1,877)	Blaine (6,939)
Havre (11,253)	Hill (18,621)
Chester (1,051)	Liberty (2,561)
Shelby (2,751)	Toole (5,042)
Cut Bank (4,018)	Glacier (11,514)
Fort Benton (1,828)	Chouteau (6,266)
Stanford (504)	Judith Basin (2,631)
Lewistown (6,941)	Fergus (13,112)
Winnett (230)	Petroleum (679)
Harlowton (1,115)	Wheatland (1,977)
Ryegate (252)	Golden Valley (879)
Roundup (2,395)	Musselshell (4,367)
Big Timber (1,648)	Sweetgrass (2,907)
Columbus (1,368)	Stillwater (5,486)
Billings (71,440)	Yellowstone (109,073)
Hardin (3,093)	Bighorn (11,716)
Red Lodge (2,285)	Carbon (8,112)

NOTE: The figures in parentheses are 1980 population estimates (medium scenario) by the Montana Department of Community Affairs: Montana Population Projections 1975-2000, Table 4, 1977.

In each case, the communities were inventoried with respect to the following six items: (1) housing, (2) schools, (3) water system, (4) sewage treatment facilities, (5) recreation facilities, (6) law enforcement. The following study presents the results of the community by community telephone survey conducted in August of 1978.

Plentywood: At the present time, there is no rental housing available, however, approximately six homes are now for sale. Eight new four-plexes are being planned. Sewage facilities are evidently not adequate at the present time; there is currently a law suit against the present sewer because of a serious leak. There are some geophysical people in town now on a presumably temporary basis and approximately ten to fifteen oil and gas related families on a permanent basis.

Wolf Point: There is a general shortage of rental units although there are six to twelve residences for sale at any one time. Local banks are apparently oriented toward future growth and are very willing to finance housing and commercial development in Wolf Point. The town has a new water filtration plant. There is plenty of water available but more storage capacity is needed. The high school, Northside School, out-of-town elementary school, and the special education program all have excess capacity to serve more students. The Southside School is approximately 24 students over capacity and the mentally retarded program is at capacity. Law enforcement services are adequate. There is a 40-bed hospital with a pediatrics ward. The hospital has twelve RNs, one surgeon, one general practitioner, and one doctor has just retired. Negotiations are presently underway to hire two more MDs.

Scobey: It is difficult to find rental housing available in town now although several apartment buildings are going up. The town has three water wells with limited storage. A new sewage lagoon has been developed which would handle approximately 3,000 people (double Scobey's present size). There is one nine-bed hospital with two doctors. Additional law enforcement would be needed if more people migrated to this town. Schools are about at capacity at the present time and recreational facilities are adequate.

Glasgow: Housing is generally tight in Glasgow although much excess housing is available on the base. There is a lot of excess school capacity and one of the schools on the base is not being completely utilized at the present. The water treatment plant is quite a bit under capacity at the present time although a new tertiary lagoon should provide more water. Police protection is adequate.

Malta: There is currently a lack of rentals in Malta, including trailer spaces although a 40-unit subdivision is being planned. Water supply is adequate and the sewage lagoon has been upgraded to handle double the town's current population. Schools are considered adequate and with some excess capacity. Law enforcement would be able to handle some population increase.

Chinook: There is a general lack of rental units in town and some new single-family dwellings are being built, along with a 41-unit subsidized housing development. Schools in Chinook are presently at capacity as are the recreational facilities. The water supply is adequate and the treatment plant is being upgraded to handle about 1,000 more people. Plans are being made for additional sewage treatment capacity.

Havre: There is currently a lot of building in town and just outside of town. The majority of these buildings are apartments, condominiums, and single-family dwellings. The sewage treatment facilities have been upgraded to handle 30,000 to 35,000 people. The water supply system is adequate. There are a significant number of oil and gas related families in town at the present.

Chester: There is a general lack of rental housing in the late summer and early fall, including trailer pads, due primarily to the influx of custom harvesting people. Schools and recreational facilities are considered adequate as are law enforcement and the town water system. Plans are in effect to expand the town's sewage treatment facilities.

Shelby: There are very few rentals available in Shelby presently, and only a few single-family dwellings for sale. Schools appear adequate, possibly with some excess capacity. Shelby needs new water lines and storage tanks. The town has good recreational facilities (two pools, tennis courts, ball fields, park, civic center). Law enforcement is adequate and there are a significant number of oil and gas related people in town at the present.

Cut Bank: A general shortage of rentals exists here with some single-family dwellings presently being built. Schools currently appear to be under capacity. Cut Bank has a new water treatment plant with resulting excess capacity. Sewage treatment facilities are adequate; however, a study is being done to determine if greater capacity will be required. The Cut Bank recreation program has recently received a grant to expand its facilities by 1979 and the community has a new senior citizen's social center. Law enforcement appears adequate at present.

Fort Benton: Few rentals are currently available in Fort Benton. Water service is being extended to the south end of town to accommodate any future building in that area. Schools, law enforcement, and sewage treatment appear adequate for the present time. The town is currently attempting to build a tennis court for increased recreational activity. Oil and gas activity is apparent in Fort Benton since the area is a service center (distribution and trucking) for oil and gas rigs in the area. A new shopping center is expected to begin construction this fall.

Stanford: Unable to make contact.

Lewistown: Although there are quite a few houses for sale, there are few rentals on the market for long. There will be many trailer spaces vacant beginning in February 1979 when a large number of Boeing Company employees leave town. The present high school is currently at capacity but a study is underway to determine if an addition is justified. The town's water supply is more than adequate although the pumping system may be updated in the future. Current plans call for an increase in sewage treatment capacity to handle 20,000-30,000 people by 1980-1981. Law enforcement is described as very good.

Harlowton: Harlowton appears to be one of the few small communities surveyed which has a good number of rental units as well as homes for sale. Schools are described as good. Excess capacity exists in both the schools and the water system. Sewage treatment facilities are being studied for a possible expansion of the sewage treatment lagoon. Possible phase out of the Milwaukee railroad could cause some future population decrease.

Roundup: There are a few apartments and very few houses available in Roundup. Public schools are at capacity with some discussion about future expansion. Two of Roundup's three water wells are in abandoned coal mines; the town's water supply is adequate although a new water storage tank which would raise capacity from one million to two million gallons is under consideration. Additional water mains would be needed for any significant population increase. Law enforcement and recreational facilities are considered adequate. There are currently about thirty families directly related to oil and gas operations who live in town. Transient drilling and seismic crews stay in motels when they are in the area.

Big Timber: There appear to be a good number of single-family and multi-family rentals in town. The grade school has some excess capacity and there are plans to build a new high school. The town's water system is being studied with the idea of upgrading it in the future to avoid summer shortfalls. An additional two cells have been added to the existing sewage treatment lagoon. Fire, police, and recreation programs are described as good.

Columbus: Although there are some homes for sale in Columbus, there are very few rentals available at present. Schools, law enforcement, and recreational facilities are considered adequate. Some excess capacity exists in Columbus in the water and sewage treatment facilities.

Hardin: There are very few rentals available in Hardin. A new high school was recently completed and takes the place of the old school; very little excess capacity exists in the schools, however. A new water treatment plant was recently installed but without additional storage, no excess capacity was generated. A new recreation facility (indoor/outdoor pool, sauna, and gym) is under consideration. Law enforcement, combined city-county, is considered adequate.

Red Lodge: The town of Red Lodge has a few rentals available most of the time. There is currently an excess capacity of about 100 in the high school system. Red Lodge is planning a new well and water storage tank which would result in a significant amount of excess capacity. Sewage treatment currently has an excess capacity of about 900. Recreation and law enforcement are considered adequate.

Based upon the preceeding inventory, it is possible to summarize the information in the table, which shows a community by community rating for selected public services and housing.

TABLE 2-1

Selected Infrastructure Rating by Community

	Housing	Water	Sewage	Schools	Law Enforcement	Recreation
Plentywood	2	1	1	2	2	2
Wolf Point	2	2	2	3	2	2
Scobey	2	2	3	2	2	2
Glasgow	2/3*	3	3	3	2	2
Malta	2/3	2	3	3	2	2
Chinook	2/3	2	3	2	2	2
Havre	2/3	2	3	2	2	2
Chester	2	2	2	2	2	2
Shelby	2	1	2	2	2	2
Cut Bank	2	3	2	3	2	2/3
Fort Benton	2	2/3	2	2	2	2/3
Lewistown	2/3**	3	3	2	2	2
Harlowton	3	3	2	3	2	2
Roundup	2	2	2	2	2	2
Big Timber	2/3	2	3	3	2	2
Columbus	2	3	3	2	2	2
Billings	3	3	3	3	3	3
Hardin	2	2	2	2	2	2
Red Lodge	2	3	3	2	2	2

Code:

1. Presently inadequate
2. Presently adequate
3. Excess Capacity (current or near future)

* Recognizes the existence of possible housing on base
** Assuming Boeing employees leave in 2/79

Stanford, Winifred, Winnett, Ryegate -- unable to make contact

GLOSSARY

AQUATIC. Living or growing in or on water.

AQUIFER. A rock formation, part of a formation, or group of formations that contains enough water—saturated permeable material to yield water to a well or spring.

CRUCIAL WILDLIFE HABITAT. Parts of a habitat necessary to sustain a wildlife population at critical periods of its life cycle.

ENDANGERED OR THREATENED SPECIES. Determined for plants and animals by one or a combination of the following factors:

1. The present or threatened destruction, modification or curtailment of a species habitat or range.
2. Over-utilization of a species for commercial, sporting, scientific or educational purposes.
3. Disease or predation of the species.
4. The inadequacy of existing regulatory mechanisms.
5. Other natural or human caused factors affecting a species' continued existence.

EROSION. The wearing away of the land surface by running water, wind, ice or other geological agents.

FORBS. Broadleafed herbs that are not grasses, sedges or rushes.

GULLYING. The erosion process where water gathers in narrow channels and removes the soil from this narrow area.

HABITAT. A specific set of physical characteristics that surround a species, group of species or a large community. In wildlife management, the major constituents of habitat are food, water, cover and living space.

IGNEOUS ROCKS. Rocks formed by solidification of molten earth materials.

MACROCLIMATE. The climate of a large geographical area.

MICROCLIMATE. The climate of a specific place within an area, contrasted with the climate of the area as a whole.

PARTICULATE CONCENTRATION. Quantitative measurement of the amount and size of particulates in the area, usually expressed in micrograms per cubic meter and microns, respectively.

RIPARIAN AREA. A specialized form of wetland with characteristic vegetation restricted to areas along, near or contiguous with rivers and streams; also, periodically flooded lake and reservoir shore areas, as well as lakes with stable water levels.

SALINITY. A measure of the mineral substances dissolved in water.

SEDIMENT YIELD. The total amount of sediment given up by a watershed over a given period, usually a year.

SEDIMENTARY ROCK. Rock formed from materials deposited from suspension or precipitated from solution and usually being more or less consolidated, principally sandstone, shales and limestones.

SEDIMENTATION. The process of the deposition of material borne by water, wind or glacier.

TERRESTRIAL. Living on or in, or growing from land.

THREATENED SPECIES. A species that the Secretary of the Interior has determined to be likely to become "endangered" within the foreseeable future throughout all or most of its range.

TURBIDITY. Inference to the passage of light through water due to insoluble particles of soil, organic material, microorganisms, etc.

WATER QUALITY. The chemical, physical and biological characteristics of water with respect to its suitability for a particular use.

WATERSHED. All lands which are enclosed by a continuous hydrologic drainage and lie upslope from a specified point on a stream.

WATER YIELD. The quantity of water derived from a unit area of watershed.

WILDCAT DRILLING. Drilling in an area not known to yield oil.

REFERENCES CITED

Bond, E.W. 1975. *A study of the influence of seismic shotholes on ground water and acquifers in eastern Montana and central Montana.* Montana Bureau of Mines and Geology Special Publication 67, Helena, Montana.

Hopkins, H.T. 1963. *The effect of oilfield brines on the potable ground water in the upper Big Pitman Creek Basin, Kentucky.* Kentucky Geological Survey Report of Investigations 4:36.

Montana Water Quality Bureau 1978. *Mining and mineral fuels development in the Montana statewide 208 study area: implications to water quality.* Montana Department of Health and Environmental Sciences, Helena, Montana.

Perry, E.S. 1931. *Groundwater in eastern Montana and central Montana.* Montana School of Mines, Butte, Montana.

Rold, J.W. 1971. Pollution problems in the "oil patch". *Association of Petroleum Geologists Bulletin* 55:808-9.

United States Bureau of Land Management 1977. Geologist, branch of lands and minerals, Montana state office. In *BLM in Montana.* USDI, Billings, Montana.

1978. 1978 *Socio-economic profile of Montana.* USDI, Billings, Montana.

1979. *Interim management policy and guidelines for lands under wilderness review.* USDI, Washington, D.C.

United States Geological Survey. *Surface operating standards for oil and gas exploration and development.* 2nd ed., USDI, Washington, D.C.

University of Texas at Austin 1976. *A primer of oil well drilling.* Austin, Texas: University of Texas Press.